

557.9
S. 884
1945

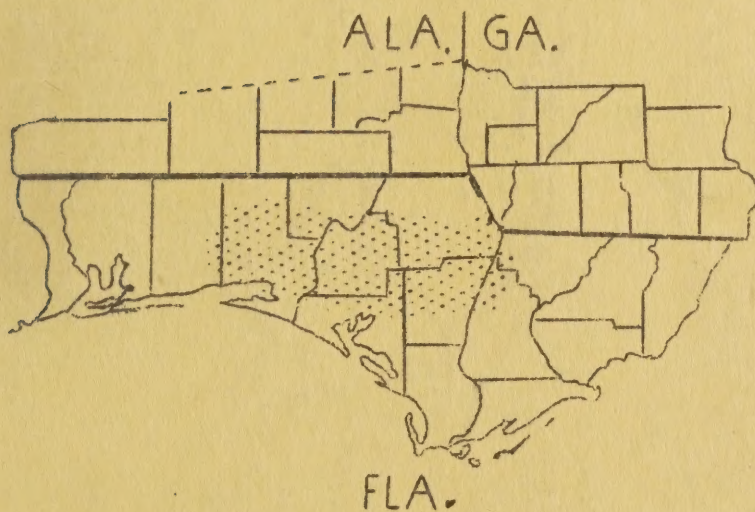
3100

SOUTHEASTERN GEOLOGICAL SOCIETY

THIRD FIELD TRIP

JUN 14 1949

WESTERN FLORIDA



NOVEMBER 9, 10, 1945

GEOLOGY

NAT.
HIST.

557.9
S0884
1945

CONTENTS

Part I.	Road Log	Page 1
	Stop No. 1	1
	Stop No. 2	4
	Stop No. 3	8
	Stop No. 4	10
	Stop No. 5	12
	Stop No. 6	13
	Stop No. 7	16
	Stop No. 8	18
	Stop No. 9	19
	Stop No. 10	21
	Stop No. 11	23
	Stop No. 12	24
	Stop No. 13	25
	Stop No. 14	27
	Stop No. 15	30
	Stop No. 16	31
	Stop No. 17	33
Part II.	Stratigraphy of the Outcropping Formations in Western Florida.....	36
	Introduction	36
	Pleistocene	36
	Pliocene	37
	Miocene	37
	General statement	37
	Duplin marl	39
	Shoal River formation	40

CONTENTS

	Page
Part I. Road Log	1
Stop No. 1	1
Stop No. 2	4
Stop No. 3	8
Stop No. 4	10
Stop No. 5	12
Stop No. 6	13
Stop No. 7	16
Stop No. 8	18
Stop No. 9	19
Stop No. 10	21
Stop No. 11	23
Stop No. 12	24
Stop No. 13	25
Stop No. 14	27
Stop No. 15	30
Stop No. 16	31
Stop No. 17	33
Part II. Stratigraphy of the Outcropping Formations in Western Florida.....	36
Introduction	36
Pleistocene	36
Pliocene	37
Miocene	37
General statement	37
Duplin marl	39
Shoal River formation	40

Chipola formation	Page 40
Tampa limestone	41
Oligocene	42
General statement	42
Upper and middle Oligocene	43
Marianna limestone	44
Upper Eocene	45
General statement	45
Ocala limestone	46
Part III. The Subsurface Stratigraphy of Western Florida	47
Introduction	47
Eocene Series	48
Claiborne group	48
Lisbon formation	49
Tallahatta formation	50
Regional correlation of the Claiborne group	51
Wilcox group	52
Regional correlation of the Wilcox group	55
Paleocene Series	55
Midway group	55
Regional correlation of the Midway group	57
Upper Cretaceous Series	57
Beds of Navarro age	57
Beds of Taylor age	58
Regional correlation of Navarro and Taylor beds	59
Beds of Austin age	59
Regional correlation of Austin group	60
Tuscaloosa group	60

	Page
Upper Tuscaloosa - Eagle Ford	61
Middle Tuscaloosa	62
Lower Tuscaloosa	63
Regional correlation of Tuscaloosa group	63
Lower Cretaceous Series	64
Trinity group	64
Paluxy and Glen Rose equivalents	64
Regional correlation of the Lower Cretaceous	66
Possible Pre-Cretaceous Series	67
Jurassic Series	67
Cotton Valley group, Buckner, Smackover and Eagle Mills formations (?)	67
Triassic Series	68
Newark group	68
Paleozoic and Pre-Paleozoic System	69
Part IV. List of Outcrops in Florida West of the Apalachicola River	70
Bay County	70
Calhoun County	70
Franklin County	71
Holmes County	71
Jackson County	73
Okaloosa County	74
Walton County	75
Washington County	77
Bibliography	81

PART I. ROAD LOG

First Day

Mileage

0.0 STOP NO. I. Road cut, U. S. Highway 90, just east of Apalachicola River, Gadsden County.

Cooke (41, pp. 122, 123) gives the following section:

SECTION AT CHATTAHOOCHEE

	<u>Feet</u>
Brandywine (?) formation (Pleistocene?):	
19. Brick-red pebbly argillaceous sand containing limonitic concretions - - - - -	10-15
18. Fine to coarse white pebbly sand, cross-bedded at base - - - - -	8
Unconformity	
Hawthorn formation (Miocene):	
17. Fine light blue-gray sandy clay and clayey sand, weathering mottled purple - - - - -	5
16. Concealed, about - - - - -	25
15. Sand in mottled white or gray and red clay - - - -	6
14. Concealed - - - - -	3
13. Stiff light green very sandy clay. Most of the sand grains are fine and round, but a few are as much as one eighth inch in diameter - - - - -	3½
Tampa limestone (Miocene):	
12. Granular chalky white limestone or clay. Adheres to tongue - - - - -	1¼
11. Concealed - - - - -	5
10. Mottled red and white sandy clay like bed 15 - - -	5
9. Very calcareous white marl or chalk. A few fragments of pelecypods near top - - - - -	5½

Mileage

Feet

8. White or gray calcareous clay mottled with red on weathered outcrops. Resembles beds 10 and 15 - - 6
7. Concealed - - - - - 5
6. Tough, dense white or cream-colored chalky limestone, somewhat harder at top than below, with conchoidal fracture that makes mammillary shapes resembling concretions. Weathers into slightly sandy gray clay like bed 8 - - - - - 47
5. Very calcareous creamy-gray clay, softer and somewhat darker than bed 6. Contains white concretions - - - - - 4
4. Granular or semicrystalline argillaceous limestone. Crumbles readily - - - - - $\frac{1}{2}$
3. Creamy-white chalk like bed 6 in alternating hard and softer layers. Contains numerous pellets or small pockets of yellowish or brownish clay and sand. Lovenia clarki (Lambert) and mollusks - - - 11
2. Covered by Penholoway terrace deposits (Pleistocene) mantled by alluvium (Recent), about - - - - 25
1. A ledge of hard white chalky limestone weathering soft and sticky is visible at low water between Chattahoochee Landing and the Louisville & Nashville Railroad bridge near River Junction - - - - 2

From the equivalent of bed 3 Mansfield (104, pp. 31, 32) reports the following mollusks:

Scaphander ballistus Mansfield?
Epitonium sp.
Arca umbonata Lamarck?
Ostrea aff. *O. antiguensis* Brown
Chlamys crocus (Cooke)
C. sp. b
Modiolus blandus Dall
Divericella sp.
Protocardia sp.
Cardium gadsdenense Mansfield
Venus? sp.
Semele silicata Dall?
Panope aff. *P. goldfussii* (Wagner)

From the equivalent of bed 6 Mansfield (104, p. 32) reports the following mollusks:

Mileage

Conus sp.
Potamides campanulatus Heilprin
Xenophora sp.
Annullina cf. A. amphora (Heilprin)
Glycymeris sp.
Chlamys crocus (Cooke)?
Lithophaga bisulcata d'Orbigny
Venericardis sp.
Cyrena cf. C. floridana Dall
Angigons shepardi Dall

Mansfield (104, p. 32) lists the following mollusks from the equivalent of beds 9 - 12:

Turritella pagodaeformis Heilprin?
Chlamys crocus (Cooke)
C. burnetti Tucker?
Lithophaga bisulcata d'Orbigny
L. antillarum (d'Orbigny)
Venericardia sp.
Anomalocardia penita (Conrad)

- - - - -

The lower half of the white "limestone" exposed at this locality is dominantly fine sandy clay, only moderately calcareous. The lowest bed now exposed is white, very argillaceous, slightly calcareous, medium hard fine-grained sandstone with abundant traces of fossils.

A water well (Fla. Geol. Surv. file No. W-276) about one mile west of this locality, with elevation of approximately 92 feet, reached definite Oligocene at depth of 210 feet. The section between base of terrace material (35 feet) and 210 feet is dominantly buff, crystalline dolomite. Some of this material is probably Tampa, older than any exposed at Stop No. 1.

The Miocene-Oligocene contact will be seen at Stop No. 10.

Go east on U. S. Highway 90 into town of Chattahoochee, and turn south. Distance to next scheduled stop 29.1 miles.

0.8 Turn right (to south) on to Fla. Highway 277, at Gulf Filling Station.

Mileage

- 2.2 Railroad station, River Junction. Continue straight ahead across railroad, on Fla. Highway 277 (graded road).
- 2.9 Road cut exposing Hawthorn (Middle Miocene).
- 3.5 Road cut exposing Hawthorn (Middle Miocene).
- 3.7 Road cut exposing Hawthorn (Middle Miocene).
- 4.9 Road fork; take road to right (Bristol Road).
- 6.4 Road fork; take road to right (Bristol Road).
- 7.1 Creek.
- 8.0 "Citronelle" in road cut.
- 10.3 Road fork; take road to right (Bristol Road).
- 10.5 Sharp right turn.
- 12.7 Creek.
- 16.4 Church and cemetery on right.
- 16.8 Junction with Torreya State Park Road, at village of Rock Bluff. Take road to left (east).
- 20.7 Junction with Fla. Highway 12. Go south (to right) on this highway (paved).
- 23.2 Lookout tower on right.
- 25.7 Turn right on to sand road, opposite sawmill (on left).
- 26.2 Road fork, take right fork.
- 28.7 Turn sharp left on to side road.
- 28.8 Turn right on to side road.
- 29.1 STOP NO. 2. Alum Bluff, on the east side of Apalachicola River, about 3 miles north of Bristol, Liberty County.

This is the type locality of the Alum Bluff Group and of the Ecphora zone of the Duplin marl.

Cooke (41, p. 191) gives the following section:

Mileage

Feet

SECTION AT ALUM BLUFF

Sunderland (?) formation (Eocene?) (perhaps
Citronelle formation, Pliocene):

- 9. Light-colored ferruginous unconsolidated sand - - 9
- 8. Hard reddish clay - - - - - 2

Citronelle formation (Pliocene):

- 7. Variegated reddish and yellowish ferruginous sand - 65

Unconformity

Duplin marl (Upper Miocene):

- 6. Brown sandy, micaceous, pyritiferous clay tasting like alum; casts of mollusks abundant near the bottom, rare above; many fossils encrusted with gypsum (?); fine slightly coherent grayish sand at top - - - - - 25
- 5. Brown or dirty-green fine sand mixed with clay; shells abundant throughout but less so at the bottom than higher (Ecphora zone) - - - - - 15
- 4. Medium-fine white or greenish micaceous sand, with a few poorly preserved mollusks at the top - - - - 3
- 3. Fine dark-gray or brownish argillaceous sand containing numerous impressions of long, slender, willowlike leaves. A few feet south of the place where this section was measured the leaf-bearing bed divides into several thin beds separated by coarse white sand; the beds pinch out and the white sand merges into the overlying bed 4, the two together forming a single $5\frac{1}{2}$ -foot bed of coarse incoherent light-colored sand stained below with iron; sharply separated from the bed below it but more or less mingled with the dark shell marl (Ecphora zone) at the top - - - - - 3

Unconformity

Chipole formation (Middle Miocene):

- 2. Light gray tough calcareous sand consisting of fine grains of transparent quartz in a white calcareous

Mileage

matrix; fossil mollusks sparingly throughout but preserved in the upper part only as casts. At the top are rounded concretionary masses several feet in diameter of hard white calcareous sandstone, which weather out and lie as boulders on the bank, - 16

1. Fine quartz sand in yellowish calcareous clay, loaded with shells; merges into overlying bed. To water level - - - - - 4

Cushman and Ponton (52) list the following species of foraminifera from this locality:

	Upper shell bed (<u>Ecphora</u> zone of <u>Duplin Fm.</u>)	Lowest shell bed (<u>Chipola Fm.</u>)
<i>Textularia agglutinans</i> d'Orbigny - - - -	x	
<i>Textularia articulata</i> d'Orbigny - - - -	x	
<i>Textularia mayori</i> Cushman - - - - -	x	
<i>Marginulina dubia</i> Neugeboren - - - - -	x	
<i>Marginulina</i> sp. - - - - -	x	
<i>Dentalina pyrula</i> d'Orbigny - - - - -	x	
<i>Lagena perlucida</i> (Montagu) - - - - -	x	
<i>Lagena clavata</i> d'Orbigny - - - - -	x	
<i>Lagena hexagona</i> (Williamson) var. <i>scalariformis</i> (Williamson) - - - - -	x	
<i>Lagena sulcata</i> (Walker and Jacob) - - - -	x	
<i>Lagena substriata</i> Williamson - - - - -	x	
<i>Lagena costata</i> (Williamson) var. <i>amphora</i> Reuss - - - - -	x	
<i>Lagena striatopunctata</i> Parker and Jones -	x	
<i>Lagena marginato-perforata</i> (Seguenza) - -	x	
<i>Guttulina costatula</i> Galloway and Wissler -	x	
<i>Globulina inequalis</i> Reuss - - - - -	x	
<i>Globulina inequalis</i> Reuss var. <i>caribaea</i> d'Orbigny - - - - -	x	
<i>Pseudopolymorphina rutila</i> (Cushman) - - -	x	
<i>Nonion grateloupi</i> (d'Orbigny) - - - - -	x	
<i>Nonionella auris</i> (d'Orbigny) - - - - -	x	
<i>Elphidium poeyanum</i> (d'Orbigny) - - - - -	x	- - - - x
<i>Elphidium advenum</i> (Cushman) - - - - -	x	
<i>Bulininella elegantissima</i> (d'Orbigny) - -	x	
<i>Bulimina inflata</i> Seguenza - - - - -	x	
<i>Virgulina punctata</i> d'Orbigny - - - - -	x	
<i>Virgulina fusiformis</i> Cushman - - - - -	x	
<i>Virgulina</i> (<i>Virgulinella</i>) <i>gunteri</i> Cushman var. <i>curtata</i> Cushman and Ponton - - - -	x	

	Upper Shell Bed	Lowest Shell Bed
Bolivina marginata Cushman - - - - -	x	
Bolivina plicatella Cushman - - - - -	x	
Uvigerina peregrina Cushman - - - - -	x	
Uvigerina parkeri Kerrar - - - - -	x	
Ellipsolagena bidens Cushman - - - - -	x	
Discorbis consobrina (d'Orbigny) - - - - -	x	
Discorbis candeiana (d'Orbigny) - - - - -	x	x
Discorbis valvulata (d'Orbigny) - - - - -	x	
Eponides mansfieldi Cushman - - - - -	x	
Cancris sagra (d'Orbigny) - - - - -	x	
Fulvinulinella pontoni Cushman - - - - -	x	
Cassidulina crasse d'Orbigny - - - - -	x	
Cassidulina laevigata d'Orbigny var. carinata Cushman - - - - -	x	
Cassidulinoides bradyi Cushman - - - - -	x	
Orbulina universa d'Orbigny - - - - -	x	x
Globorotalia menardii (d'Orbigny) - - - - -	x	
Cibicides concentricus (Cushman) - - - - -	x	
Dyocibicides biserialis Cushman and Valentine - - - - -	x	
Quinqueloculina seminula (Linne) - - - - -		x
Hauerina bradyi Cushman - - - - -		x
Articulina sagra d'Orbigny var. miocenica Cushman and Ponton - - - - -		x
Triloculina oblonga (Montagu) - - - - -		x
Triloculina gracilis d'Orbigny - - - - -		x
Triloculina quadrilateralis d'Orbigny var. longiscostata Cushman and Ponton - - - - -		x
Vertebralina multilocularis (H. B. Brady, Parker and Jones) - - - - -		x
Guttulina irregularis (d'Orbigny) - - - - -		x
Globulina gibba d'Orbigny - - - - -		x
Elphidium incertum (Williamson) var. - - - - -		x
Elphidium chipolensis (Cushman) - - - - -		x
Peneroplis proteus d'Orbigny - - - - -		x
Sorites? sp.? - - - - -		x
Discorbis candeiana (d'Orbigny) var. bullata Cushman and Ponton - - - - -		x
Amphistegina chipolensis Cushman and Ponton - - - - -		x
Cibicidella variabilis (d'Orbigny) - - - - -		x

Return to Fla. Highway 12, follow it south to Bristol, and go west on Fla. Highway 500 to Clarksville.

Distance to next scheduled stop 19.7 miles.

Mileage

- 32.5 Back at Fla. Highway 12. Go south (to right).
- 34.1 Junction with Fla. Highway 500 in Bristol. Go west (to right) on this highway.
- 34.4 Liberty County court house on right.
- 36.0 Apalachicola River.
- 38.8 Calhoun County court house, in Blountstown.
- 47.1 Chipola River.
- 47.9 East limits of Clarksville. Continue on Fla. Highway 500 through village.
- 48.2 Turn right on to woods road, at west limits of Clarksville.
- 48.3 Turn right on to faint road (almost grassed over).
- 48.7 Keep to right. White house in distance on left.
- 48.8 STOP NO. 3. Dripping Springs on Four Mile Creek, about $\frac{1}{2}$ mile north of Clarksville, in NE $\frac{1}{4}$ Sec. 36, T1N, R10W, Calhoun County.

Cooke (41, p. 187) gives the following section:

SECTION ON FOUR MILE CREEK NEAR CLARKSVILLE

	<u>Feet</u>
Sunderland(?) formation (Pleistocene?):	
4. Steeply sloping bluff covered by sandy loam (approximately) - - - - -	50
Duplin marl (Upper Miocene):	
3. Gray micaceous clay (exposed) - - - - -	4
2. Greenish-gray very fossiliferous marl (<u>Ecphora</u> zone), lower 2 feet composed almost exclusively of closely packed shells; less shelly above and grading into the overlying micaceous clay - - - -	5
1. Covered to water level - - - - -	6

- - - - -

The Calhoun Oil and Gas well was drilled near this locality in 1920.. Its elevation is approximately 143 feet, and the well reached a depth of 1320 feet. Below 20 feet of Pleistocene (?) sand the Duplin formation was penetrated between depths 20 and 100 feet;*and the Tampa limestone between 160 and 350 feet. The Oligocene extends from depths 360-750 feet; no samples available between 750 and 915 feet. A sample at 915 feet has upper Jackson (Ocala) fossils. *Alum Bluff Group from 100 to 160'.

Cushman and Fenton (52) list the following species of foraminifera from this locality:

Textularia agglutinans d'Orbigny
Textularia mayori Cushman
Textularia candeiana d'Orbigny
Marginulina dubia Neugeboren
Dentalina communis d'Orbigny
Nodosaria catesty d'Orbigny
Lagena perlucida (Montagu)
Lagena clavata d'Orbigny
Lagena sulcata (Walker and Jacob)
Lagena substriata Williamson
Guttulina costatula Galloway and Wissler
Globulina inequalis Reuss
Globulina inequalis Reuss var. *caribbea* d'Orbigny
Pseudopolymorphina dumblei (Cushman and Applin)
Pseudopolymorphina rutila (Cushman)
Nonion greteloupi (d'Orbigny)
Nonion pizarrensis Berry
Nonionella auris (d'Orbigny)
Buliminella elegantissima d'Orbigny
Bulimina gracilis Cushman
Virgulina punctata d'Orbigny
Bolivina marginata Cushman
Uvigerina peregrina Cushman
Uvigerina auberiana d'Orbigny
Angulogerina occidentalis (Cushman)
Discorbis floridana Cushman
Discorbis consobrina (d'Orbigny)
Eponides mansfieldi Cushman
Cancris sagrai (d'Orbigny)
Cassidulina crosse d'Orbigny
Cassidulinoides bradyi Cushman
Orbulina universa d'Orbigny
Globorotalia menardii (d'Orbigny)
Planulina depressa (d'Orbigny)
Cibicides concentricus (Cushman)
Cibicides lobatulus (Walker and Jacob)
Dycocibicides biserialis Cushman and Valentine

Mileage

Return to Fla. Highway 500, go east 0.2 mile, and turn north on to Fla. Highway 84.

Distance to next scheduled stop 5.6 miles.

49.4 Back at Fla. Highway 500. Go east (to left).

49.6 Turn north (to left) on to Fla. Highway 84, and follow it to Ten Mile Creek (4.8 miles distant).

54.4 STOP NO. 4. Exposures of Chipola marl (Middle Miocene) in banks of Ten Mile Creek, just downstream from bridge, Fla. Highway 84, in W $\frac{1}{2}$ Sec. 12, T1N, R10W, Calhoun County.

About 6 feet of gray, calcareous, sandy clay with abundant well preserved fossils is exposed just above creek level, at the bridge and in the banks of the creek at several places downstream from the bridge. The highly fossiliferous clay, together with the 8 feet or more of sparsely fossiliferous, argillaceous sand above, are typical of the Chipola formation. Top of the Tampa limestone is probably only a few feet below the base of the exposure.

The molluscan fauna at this locality is both abundant and varied. Some of the genera represented are: Arca, Corbula, Dentalium, Docina, Leda, Mitra, Murex, Mya, Nucula, Oliva, Ostrea, Sigeretus, and Turritella.

The ostracod Cytheretta karlane Howe and Fyeatt was identified from this locality by Howe et al (84).

A small nautiloid has been found at this locality.

Cushman and Ponton (52) list the following species of foraminifera from this locality:

Textularia agglutinans d'Orbigny
Textularia candeiana d'Orbigny
Quinqueloculina seminula (Linne)
Quinqueloculina candeiana d'Orbigny
Quinqueloculina costata d'Orbigny
Quinqueloculina crassa d'Orbigny var. *subcuneata* Cushman
Quinqueloculina chipolensis Cushman and Ponton
Messilina inaequalis Cushman
Messilina bosci (d'Orbigny)
Messilina quadrans Cushman and Ponton
Messilina incisa Cushman and Ponton
Messilina spinata Cushman and Ponton
Messilina spinata Cushman and Ponton var. *chipolensis*
Cushman and Ponton

Massilina spinata Cushman and Ponton var. *glabrata*
Cushman and Ponton
Spiroloculina grateloupi d'Orbigny
Hauerina bradyi Cushman
Articulina sagra d'Orbigny var. *miocenica* Cushman
and Ponton
Articulina mayori Cushman
Triloculina trigonula (Lamarck)
Triloculina oblonga (Montagu)
Triloculina gracilis d'Orbigny
Triloculina quadrilateralis d'Orbigny
Triloculina schreiberiana d'Orbigny
Triloculina quadrilateralis d'Orbigny var. *longicostata*
Cushman and Ponton
Triloculina brongniartii d'Orbigny
Pyrge subsphaerica (d'Orbigny)
Pyrge denticulata (H. G. Brady)
Cornuspira involvens (Reuss)
Vertebrulina multilocularis (H. B. Brady, Parker, and Jones)
Lagena perlucida (Montagu)
Guttulina irregularis (d'Orbigny)
Guttulina lactea (Walker and Jacob)
Globulina gibba d'Orbigny
Globulina inaequalis Reuss
Globulina inaequalis Reuss var. *caribaea* d'Orbigny
Pseudopolymorphina dumblei (Cushman and Applin)
Polymorphina advena Cushman
Sigmomorphina pearceyi Cushman and Ozawa
Nonion glabrellum Cushman
Nonionella auris (d'Orbigny)
Elphidium poeyanum (d'Orbigny)
Elphidium chipolensis (Cushman)
Peneroplis proteus d'Orbigny
Peneroplis bradyi Cushman
Sorites? sp.?
Virgulina pontoni Cushman
Eponides antillarum (d'Orbigny)
Rotalia beccarii (Linne) var. *parkinsoniana* (d'Orbigny)
Asterigerina carinata d'Orbigny
Amphistegina chipolensis Cushman and Ponton
Cassidulina chipolensis Cushman and Ponton
Orbulina universa d'Orbigny
Cibicides concentricus (Cushman)
Cibicides refulgens (Montfort)
Dyocibicides biserialis Cushman and Valentine
Annulocibicides projectus Cushman and Ponton
Acervulina chipolensis Cushman and Ponton

Continue north on Fla. Highway 84 for 2.6 miles to village of Chason,
then turn east on to Fla. Highway 543.

Mileage

Distance to next scheduled stop 5.2 miles.

- 57.0 Turn right (to east) on to Fla. Highway 543 at Gulf Filling Station, in village of Chason.
- 58.7 Turn right across road ditch, just west of Willis Bridge over Chipola River, and follow woods road south along west bank of river.

Tampa limestone with Sorites sp., etc., is exposed on the east bank of the river just below the bridge.

- 59.4 Look and Tremble rapids in Chipola River, on left. The rapids (or shoals) are made by outcrop of a hard ledge of Tampa (Lower Miocene) limestone. The foraminifer, Archaias floridanus, was noted in the hard limestone.
- 59.5 Road fork; take road to left.
- 59.6 STOP NO. 5. Exposure of Tampa limestone (Lower Miocene) in west bank of Chipola River 0.9 mile (by road) downstream from Willis Bridge on Fla. Highway 543, Calhoun County. SW $\frac{1}{4}$ Sec. 32, T2N, R9W.

SECTION EXPOSED AT THIS LOCALITY

	<u>Feet</u>
Fleistocene(?)	
4. Fine sand - - - - -	10 $\frac{1}{2}$
Tampa limestone (Lower Miocene):	
3. White, chalky, fossiliferous limestone. Abundant imprints and internal molds of mollusks; rare fragments of echinoids - - - - -	10
2. Buff, "silty," sparsely fossiliferous dolomite - -	4
1. Buff, fossiliferous, dolomitic limestone with numerous cavities where shells have been dissolved. From 2 feet above low water level to 2 feet below water - - - - -	4

Mansfield (104) lists the following species of mollusks from the Tampa limestone at Willis Bridge and at Hamilton Spring, about $1\frac{1}{2}$ miles below Willis Bridge:

Mosum chipolenum tampanum Mansfield
 Glycymeris lamyi Dall
 Chlamys burnetti Tucker?
 Venericardia serricosta Heilprin

Mileage

Antigona glyptococha Dell
A. shepardi Dell
Amelocardia penita (Conrad)

Return to Chason and go north on Fla. Highway 84 to Marianna.

Distance to next scheduled stop 22.0 miles.

62.2 Back at Chason. Go north (to right) on Fla. Highway 84.

64.3 Jackson-Calamoun County line.

68.6 Road to peacock Bridge, on right. Continue straight ahead on Fla. Highway 84.

74.8 Dry Creek. Note: Byram limestone (Oligocene) is exposed in creek banks, about one half mile downstream from Fla. Highway 84.

80.0 Marianna (Lower Oligocene) - Byram (Middle Oligocene) contact exposed in road bank, on right.

80.1 Road fork. Keep to right on Fla. Highway 84.

80.8 Junction with U. S. Highway 90, at Jackson County courthouse, in Marianna.

Turn left and proceed to Chipola Hotel for lunch.

80.9 Chipola Hotel, on left.

After lunch, go east on U. S. Highway 90 to east edge of Marianna (0.7 mile from hotel).

81.6 STOP NO. 6. Type locality of Marianna limestone. Road cut, U. S. Highway 90, at east edge of Marianna, just west of Chipola River, Jackson County, SE $\frac{1}{4}$ Sec. 3, T4N, R10W.

The following section is exposed at this locality:

Byram formation (Oligocene)

8. Buff, dense, hard, finely crystalline dolomite, with imprints of fossils (exposed at top of the new road cut) - - - - -

3

Marianna limestone (Lower Oligocene)

7. Hard, gray limestone. (Exposed in the new road cut) - - - - -

3

Feet

Mileage

Feet

6. Soft, white, massive, chalky limestone (typical "chimney rock"). Abundant Lepidocyclina mantelli and Pecten poulsoni. (Exposed in the new road cut) - - - - - 15
5. Medium hard, glauconitic limestone. (Exposed along the old road, about 100 feet south of the new highway - - - - - 6 1/2
4. Covered, about - - - - - 5

Marianna or Ocala

3. Hard, brittle, fossiliferous limestone, with Lepidocyclina fragilis. Forms ledge a few yards back from river's edge at low stage - - - - - 4
2. Covered, about - - - - - 5

Ocala limestone (Upper Eocene)

1. Soft, granular limestone, with abundant bryozoa and large and small foraminifera - - - - - 2

- - - - -

Cole and Ponton (18) list the following species of foraminifera from the Marianna limestone in this area:

Angulogerina byramensis (Cushman)
 Anomalina bilateralis Cushman
 A. mississippiensis Cushman
 A. vicksburgensis Cushman
 Bolivina ariana Cole and Ponton
 Cibicides americanus (Cushman)
 C. lobatulus (Walker and Jacob)
 C. pseudoungerianus (Cushman)
 Dentalina communis (d'Orbigny)
 Eponides byramensis (Cushman)
 E. mariannensis (Cushman)
 Globigerina bulloides d'Orbigny
 G. dutertrei d'Orbigny
 G. triloba Reuss
 Globulina gibba d'Orbigny
 Lenticulina convergens (Borneman)
 L. rotulata (Lamarck)
 L. vicksburgensis Cushman
 L. vicksburgensis Cushman var. aperta
 Lepidocyclina mantelli (Morton)
 Liebusella byramensis (Cushman)

Nodosaria obliqua (Linne)
 N. vertebralis (Betsch)
 Nonion umbilicatulum (Montagu)
 Planorbulina larvata Parker and Jones
 Planulina byramensis (Cushman)
 Robulus cultratus (Montfort)
 Saracenaria italica DeFrance
 Siphonina advena Cushman
 Uvigerina pygmaea d'Orbigny

Cushman (53) lists the following foraminifera from the "lowest bed of Ocala limestone exposed":

Textularia subhauerii Cushman
 Planularia truncata (Gumbel)
 Dentalina cooperensis Cushman
 Nodosaria latejugata Gumbel
 N. fissicostata (Gumbel)
 Guttulina irregularis (d'Orbigny)
 G. spicaeformis (Roemer)
 Globulina gibba d'Orbigny
 Operculinoides mariannensis (Vaughan)
 Reussella eocena (Cushman)
 Discorbis ocalana Cushman
 Eponides jacksonensis (Cushman and Applin)
 Siphonina jacksonensis Cushman and Applin
 Cibicides mississippiensis (Cushman)
 C. mississippiensis (Cushman) var. ocalanus Cushman

Cooke (41, p. 67) states that T. W. Vaughan has identified the following species of larger foraminifera from the Ocala at Marianna:

Operculinoides ocalanus (Cushman)
 O. mariannensis (Vaughan)
 Heterostegina ocalana Cushman
 Disocyclina (Asterocyclina) americana (Cushman)?
 D. georgiana (Cushman)
 D. mariannensis (Cushman)
 D. mariannensis var. papillata (Cushman)
 D. vaughani (Cushman)
 Pseudophragmina (Proporocyclina) citrensis (Vaughan)
 Lepidocyclina (Lepidocyclina) georgiana Cushman
 L. (Nephrolepidina) fragilis Cushman

Cann and Bassler (14) list 56 species of Bryozoa from the Ocala at Marianna.

Gregory (75) describes a teleost fish, Lutianus avus Gregory, from the Marianna in a road cut just east of this locality.

Mileage

Turn around and follow U. S. Highway 90 to west edge of Marianna, then turn right on to Fla. Highway 6.

Distance to next scheduled stop 5.1 miles.

82.3 Chipole Hotel, on left.

84.3 Turn right on to Fla. Highway 6.

86.7 STOP NO. 7. Cliff about 75 yards east of Fla. Highway 6, at top of a hill, in the SW $\frac{1}{4}$ Sec. 30, T5N, R10W, Jackson County. The cliff cannot be seen from the road.

The following section is exposed in the cliff:

	<u>Feet</u>
Byram (Middle Oligocene) (?)	
3. Soft to hard, cream-colored, irregularly bedded, glauconitic limestone. The upper part is more chalky and less glauconitic than the lower half - - - - -	43
2. Hard, cream-colored to brown, glauconitic limestone with abundant large <i>Lepidocyclina</i> . Forms ledge - - - - -	7
1. Soft, yellowish, granular limestone. (May be Marianna) - - - - -	6

The following species of foraminifera have been identified:

	<u>Bed 3</u>	<u>Bed 2</u>	<u>Bed 1</u>
<i>Lepidocyclina</i> spp. - - - - -	x	x	x
<i>Lenticulina vicksburgensis</i> - - -	x		
<i>Liebusella byramensis</i> - - - - -	x	x	x
<i>Operculinoides dius</i> - - - - -	x	x	x
<i>Siphonina savena</i> - - - - -	x	x	x
<i>Textularia conica</i> - - - - -	x		
<i>Uvigerina vicksburgensis</i> - - - -	x		
<i>Asterigerina subacuta</i> - - - - -		x	
<i>Cibicides mississippiensis</i> - - - -		x	
<i>Eponides byramensis</i> - - - - -		x	x
<i>Gypsin</i> sp. (small) - - - - -		x	
<i>Operculinoides vicksburgensis</i> - - - -		x	
<i>C.</i> cf. <i>massuensis</i> - - - - -		x	
<i>Planorbulina larvata</i> - - - - -		x	
<i>Eponides mariannensis</i> - - - - -			x

Mileage

No careful study was made of the *Lepidocyclina*s, but the following species were tentatively identified: *L. favosa*, *L. undosa*, *L. yurnagunensis* var. Until more study is made of the fossils present the exact age of the beds exposed must remain in doubt.

Continue north on Fla. Highway 6.

Distance to next scheduled stop 9.7 miles.

- 87.0 Graded road, on right, leads to Stones Cave, Woodward's Cave, Rattlesnake Hollow, etc. Continue straight ahead on Fla. Highway 6.
- 87.7 San Smith's quarry can be seen in distance, on right. The quarry is in Marianna limestone, but Byram is exposed at top of the quarry.
- 87.9 Byram exposed in road ditch, on right.
- 89.0 Baker's Creek.
- 89.2 Top bed of Ocala is exposed on left.
- 89.3 Marianna exposed on right.
- 89.4 Marianna exposed on both sides of highway.
- 89.8 Ocala is exposed in a cave, in the woods on the right.
- 90.1 Marianna limestone, with *Ostrea vicksburgensis*. The top bed of Marianna is exposed in the woods on the left.
- 90.7 Store and side road, on right.
- 91.2 Junction with U. S. Highway 231. Continue straight ahead on U. S. 231 and Fla. Highway 6.
- 92.1 Russ Creek.
- 94.6 Turn right on to graded road, just north of house on right.
- 94.9 Top bed of Ocala is exposed in woods on left.
- 95.1 Ocala is exposed in road bed.
- 95.3 Quarry in Ocala limestone, on left.
- 95.4 Sharp right turn in road.
- 95.6 Quarry in Ocala limestone, on right. Abundant and well preserved echinoids may be found in quarry.

Mileage

96.2 Turn left on to graded road.

96.4 STOP NO. 8. Abandoned quarry in Ocala limestone about 200 yards north of road. Located in SE $\frac{1}{4}$ Sec. 32, T6N, R11W, at the head of Waddell's Mill Pond about 12 miles north of Marianna, Jackson County.

About 35 feet of Upper Ocala limestone is exposed in this quarry.

Fossils are abundant and varied. Some of the more prominent species are:

Foraminifera

Asterocyclina spp. (very abundant)

Echinoides

Oligopygus haldemani

Echinocyamus sp.

Laganum sp.

Mollusca

Anusium ocalanum (abundant)

Iecten spillmani

Cardium sp.

Bryozoa (very abundant)

The following species of foraminifera are also present:

Cibicides mississippiensis

Pseudophragmina citrensis

Eponides cf. ocalanus

Globigerina sp.

Globorotalia cocosensis

Gypsina globula (small)

Gyroldina sp. (large)

Lepidocyclina ocalana

Lingulina sp.

Operculinoides mariannensis

O. ocalanus

Fyrge inornatus

Siphonina jacksonensis

Textularia mississippiensis var.

Turn around and return to Marianna.

Distance to next scheduled stop 13.9 miles.

96.7 Turn left and follow graded road to south.

Mileage

- 97.0 Springfield Church on left.
- 98.5 Russ Creek
- 99.7 Turn left on to U. S. Highway 231 and Fla. 6, and return to Marianna.
- 108.1 Chipola Hotel, on right. Go straight ahead.
- 108.3 Turn left (to north) on Fla. Highway 84 (Caverns State Park Road).
- 109.1 Suwannee exposed in ditch, on left.
- 109.3 Top of hill. "Citronelle" and weathered Suwannee exposed in road cut.
- 109.8 Chipola River.
- 110.3 STOP No. 9. Road cut, Marianna Caverns State Park Road, at top of hill, in the NE $\frac{1}{4}$ Sec. 34, T5N, R10W, 2 miles north of Marianna, Jackson County.

The following section is exposed:

	<u>Feet</u>
Fleistocene (?) terrace material	
10. Mottled sandy clay and red sand and gravel - - -	8
Byram (Oligocene)	
9. Pale green to brown, waxy, bentonitic clay - - -	2 $\frac{1}{2}$
8. Light buff, finely crystalline, weakly glauconitic dolomite. Hard and soft beds. Fossil molds and carbonized plant fragments. - - -	6
7. Lens of hard, white, fossiliferous limestone. <u>Lepidocyclina</u> sp., <u>Pecten poulsoni</u> . Maximum thickness - - - - -	3
6. Light buff, firm, finely crystalline dolomite, with fossil molds. Softer in upper portion - - -	6
Marianna (Lower Oligocene)	
5. Hard, whitish limestone. Abundant <u>Lepidocyclina mantelli</u> - - - - -	2

<u>Mileage</u>		<u>Feet</u>
4.	Light buff marl. Abundant <u>Lepidocyclina mantelli</u> - - - - -	1 1/2
3.	Medium hard, white limestone - - - - -	1
2.	Soft, buff, argillaceous(?) limestone. Abundant <u>Lepidocyclina mantelli</u> - - - - -	1 1/2
1.	Soft, white, chalky limestone (typical "chimney rock"), exposed to bottom of valley. About - - -	10

Some of the foraminifera present at this locality are:

	<u>Byram</u>	<u>Marianna</u>
<u>Cilicoides americanus</u> - - - - -	x	x
<u>Eponides byramensis</u> - - - - -	x	x
<u>Lepidocyclina supera</u> - - - - -	x	
<u>Operculinoides dius</u> - - - - -	x	x
<u>Siphonina advena</u> - - - - -	x	x
<u>Angulogerina byramensis</u> - - - - -		x
<u>Bolivina</u> spp. - - - - -		x
<u>Cibicides lobatulus</u> - - - - -		x
<u>C. mississippiensis</u> - - - - -		x
<u>Dentalina</u> cf. <u>vertebralis</u> - - - - -		x
<u>Lepidocyclina mantelli</u> - - - - -		x
<u>Lenticulina vicksburgensis</u> - - - - -		x
<u>Liebusella byramensis</u> - - - - -		x
<u>Nonion</u> cf. <u>planatum</u> - - - - -		x
<u>Falmula caelata</u> - - - - -		x
<u>Saracenaria</u> sp. - - - - -		x
<u>Uvigerina vicksburgensis</u> - - - - -		x

Note: About one half mile farther north along this road is the entrance to Florida Caverns State Park. As the name of the park indicates, the main attraction is a cavern. It is developed mainly in Ocala limestone (Upper Eocene), with the lower, hard glauconitic part of the Marianna limestone (Lower Oligocene) forming the roof in some places. A water well having an elevation of 121 feet and a total depth of 200 feet was drilled at Park headquarters near the entrance to the cavern. This well penetrated Marianna limestone from 0 - 35 feet and Ocala limestone from 35 - 200 feet.

All of the features common to limestone caves are beautifully developed in the cavern here. Also many fossils (Amusium ocalanum, Pecten, Asterocyclina and Lepidocyclina, a nautiloid, etc.) can be seen in the roof of the cavern. The living flore and fauna of the Caverns State Park include many species which do not range so far south in any other area.

Second Day

Mileage

- 0.0 Chipola Hotel, Marianna, Fla.
Follow U. S. Highway 90 west to Chipley, 19 miles distant.
Distance to first scheduled stop 23.6 miles.
- 2.0 Road forks at west edge of Marianna. Keep to left on U. S. Highway 90.
- 9.1 East limits of Cottondale.
- 14.4 Washington-Jackson County Line.
- 18.9 East limits of Chipley, county seat of Washington County.
- 19.4 Turn left (to south) on to Fla. Highway 52, at stop light, in Chipley.
- 20.1 Go straight ahead on graded road; paved road (Fla. Highway 52) curves to right.
- 22.0 Side road, on left. Straight ahead.
- 22.5 Side road, on right. Straight ahead.
- 22.8 Golf course, on right.
- 23.0 Turn left through gate, and follow road through fields 0.6 mile.
- 23.6 STOP NO. 10. Falling Water Sink, four miles south of Chipley, in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 27, T4N, R13W, Washington County, Fla.

Vernon (151, pp. 60-61) gives the following section:

	<u>Feet</u>
Deposits underlying the 250-320 foot surface	
5. Red to yellow mottled sands and gravel wash - - -	30.0
Tampa formation	
4. Red to yellow, sandy clay soil with siliceous nodules and float - - - - -	20.0
3. Light greenish-gray, saccharoidal, argillaceous sandy marl. Encloses thin lenses of fine green sand, a few pebbles, and a $\frac{3}{4}$ -inch oyster and <u>Pecten</u> bed - - - - -	11.5

Mileage

Feet

Suwannee (Chickasawhay-Byram) limestone (elevation 143 feet).

2. Cream to buff, granular, foraminiferal coquina in a limestone matrix. Fragments of macro-fossils are rare. Amphistegina sp. cf. A. chipolensis Cushman and Ponton, Mississippina sp. Siphonina sp. cf. S. advena Cushman, Gypsina sp., Neussella sp., Bairdopbilata martyni Coryell, Sample, and Jennings, Hemicythere sp., Archicythereis n. sp., Lepidocyclina favosa Cushman, Lepidocyclina undosa Cushman, and Operculinoides muirii Barker are present - - - - - 68.0
1. Buff to light gray, granular, foraminiferal coquina made up largely of Lepidocyclina favosa Cushman and L. undosa Cushman, exposed in cave below sink floor. In addition to all the species of bed number two, Elphidium sp., Nonion grateloupi (d'Orbigny), Clypeaster rogersi (Morton), Ostrea vicksburgensis Conrad, and Pecten sp. were found - - - - - 4.3
- Total - - - - - 133.8

The Chipley Oil Company's Dekle No. 1 well was drilled about 100 yards north of Felling Water Sink. It was drilled to a depth of 4912 feet, and completed in 1921. Elevation of the well is 198 feet. The well penetrated Tampa limestone between depths 25-55 feet; Oligocene between 55 and 240 feet; Ocala between 240-365 feet. Cretaceous was reached at depth of 2540 feet.

This locality is one of the few where the Miocene-Oligocene contact is exposed. Water Falls Sink, in Grady County, southwestern Georgia, a large circular sink about 70 feet deep, exposes a similar section.

Return to road at gate, and turn south (to left).

Distance to next scheduled stop 6.2 miles.

- 24.1 Back at gate. Turn left on to graded road and follow it south 2.2 miles.
- 26.3 End of north-south road. Turn right (to west) on graded road.
- 27.0 Cross road. Go straight ahead.
- 27.8 Junction with Fla. Highway 52. Go straight across the paved highway.

Mileage

- 29.1 Turn right at crossroads.
- 29.4 Turn left on to side road.
- 29.8 STOP NO. 11. Abandoned quarry in woods about 200 yards to right (north), near Duncan Church, in SE $\frac{1}{4}$ Sec. 36, T3N, R14W, Washington County, Fla.

The following section is exposed in the old quarry: Feet

Byram (Glendon) limestone (Middle Oligocene)..	
2. Hard, cherty limestone - - - - -	3
1. Cream-colored, granular, massive, limestone.	
Lepidocyclina spp. (abundant), Pecten sp. (rare) -	15 $\frac{1}{2}$

Cole (19) records the following species of orbitoid foraminifera from the Glendon limestone of this locality and general area:

Lepidocyclina (Lepidocyclina) supera (Conrad)	
L. (L.) yurnagunensis Cushman	
L. (L.) yurnagunensis Cushman, var. morganopsis Vaughan	
L. (Eulepidina) undosa Cushman	
L. (E.) undosa Cushman, var. tumida Vaughan	
L. (E.) favosa Cushman	

Some small foraminifera from the granular limestone at this locality are:

Asterigerina subacuta
Discorbis sp.
Eponites byramensis
Reussella sculptilis
Rotelia byramensis
Siphonina advena

Continue west 0.1 mile, then turn south.

Distance to next scheduled stop 24.3 miles.

- 29.9 Turn left by New Home Methodist Church on left, and Duncan Church on right.
- 30.2 Turn right on to east-west road.
- 30.9 Sharp left turn.
- 31.1 Road forks. Keep to right.

Mileage

- 32.6 Junction with Fla. Highway 163; at Brock. Turn left on to Fla. 163 (paved) and follow it to Vernon, 7.0 miles distant.
- 39.7 Courthouse in Vernon. Turn left on to Fla. Highway 39 and follow it to southwest for 11.5 miles.
- 42.8 "Citronelle" mottled sandy clay in road cut, on right.
- 46.7 Blacksmith shop, on right.
- 46.9 Exposure of Shoal River (weathered, only imprints of fossils) in road cut, on right.
- 47.9 Church and cemetery on left.
- 51.3 Turn right on to Shell Landing Ferry Road.
- 52.1 Three small bridges.
- 52.5 Turn left on to sand road (not graded).
- 53.3 Lake on left.
- 54.1 STOP NO. 12. Exposure of Chipola limestone (Miocene) in the west bank of Holmes Creek, SE $\frac{1}{4}$ Sec. 5, T1N, R16W, Washington County.

The exposure is about $\frac{1}{4}$ mile downstream from a small stave mill, which is in the community called Spring Hill or Holmes Creek.

Several feet of buff, sandy, very fossiliferous limestone is exposed. Vernon (151, p. 84) states that this is "possibly the best locality for collecting Chipola fossils in Washington County." He lists 21 species of Mollusca from this locality, and the following species of foraminifera from a boring in the unweathered upper portion of the section:

Amphistegina chipolensis Cushman and Ponton
Angulogerina occidentalis (Cushman)
Bolivina marginata Cushman
Cancris sagra (d'Orbigny)
Cibicides floridanus (Cushman)
Discorbis candeiana (d'Orbigny)
Elphidium advenum (Cushman)
E. chipolensis (Cushman)
E. Sagrum (d'Orbigny)
E. sp.
Eponides antillarum (d'Orbigny)
Globigerina sp.
Globulina gibba d'Orbigny

Mileage

Globulina inequalis Reuss, var. caribaea d'Orbigny
Gypsina vesicularis (Parker and Jones)
Lagena perlucida (Montagu)
Reusella spinulosa (Reuss)
R. cf. rectimargo (Cushman)
Textularia articulata (?) d'Orbigny
Virgulina miocenica Cushman and Ponton
V. pontoni Cushman

Return to Fla. Highway 39 and follow it to southwest (to right)
for 7.3 miles.

Distance to next scheduled stop 28 miles.

- 55.6 Back at Shell Landing Ferry Road. Turn right.
56.7 Turn south (to right) on Fla. Highway 39.
57.4 Pleistocene sand in road cut.
63.8 Ebro Post Office, store and filling station, on left.
64.0 Road junction. Turn right on to Fla. Highway 10 and follow it
west about 6 miles.
65.6 Choctawhatchee River.
69.9 Turn right (north) on to Fla. Highway 88 and follow it to Red Bay,
about 10 miles.
75.6 Seven Runs Creek.
79.9 Red Bay. Turn right on to sand street in front of school and
park in front of home of Mr. Ed. McDaniel.

Note: The old Gomillion farm is now the McDaniel farm.

- 80.1 STOP NO. 13. Exposure of the Arca zone of the Shoal River formation
at a small spring head, about $\frac{1}{4}$ mile east of Red Bay, in the SW $\frac{1}{4}$
Sec. 10, T2N, R17W, Walton County.

About 19 feet of material is exposed.

The lower 8 feet is gray, compact, sandy marl with abundant
fossils; this grades upward into buff, argillaceous sand and
sandy clay.

Mensfield (95) lists about 30 species of mollusks, and

Mileage

Howe et al. (84) list 16 species and varieties of Ostracods from this locality.

Cushman and Ponton (52) list the following species of foraminifera from this locality:

Angulogerina occidentalis (Cushman)
Bolivina marginata Cushman
B. marginata var. multicostata Cushman
B. floridana Cushman
Bulimina gracilis Cushman
B. inflata Sequenza
Buliminella curta Cushman
B. elegantissima (d'Orbigny)
Cancris sagra (d'Orbigny)
Cassidulina crassa d'Orbigny
C. laevigata var. carinata Cushman
Cibicides concentricus (Cushman)
Dentelina communis d'Orbigny
Discorbis floridana Cushman
Dyocibicides biserialis Cushman and Valentine
Elipsolagena bidens Cushman
Elphidium advenum (Cushman)
E. sagra (d'Orbigny)
Eponides mensfieldi Cushman
Globulina rotundata (Bornemann)
Lagena clavata d'Orbigny
L. perlucida (Montagu)
L. substriata (Williamson)
Loxostoma gunteri Cushman
Nonion pizarrensis Berry
Nonionella auris (d'Orbigny)
Orbulina universa (d'Orbigny)
Plectofrondicularia floridana Cushman
Protonina difflugiformis (H. B. Brady)
Pseudarcella arenata Cushman
Pseudopolymorphina dumblei (Cushman and Applin)
Pulvinulinella pontoni Cushman
Reussella spinulosa (Reuss)
Robulus americanus (Cushman)
R. americanus var. spinosus (Cushman)
R. catenulatus (Cushman)
Siphogenerina lamellata Cushman
Valvulineria floridana Cushman
Virgulina punctata d'Orbigny
V. (Virgulinella) gunteri Cushman
Uvigerina peregrina (Cushman)

Mileage

Continue north on Fla. Highway 88 for 3.5 miles.

Distance to next scheduled stop 10.5 miles.

- 83.0 White's Creek.
- 83.5 Store and filling station, on left.
- 84.7 Side road, on right. Go straight ahead.
- 85.3 Bearden's grocery store on right, side road on left; go straight ahead.
- 86.8 Bridge over creek.
- 87.1 Turn right at crossroads; four mail boxes on left at crossroads.
- 87.3 Small bridge.
- 88.0 Mottled sandy clay in road banks.
- 88.7 Side road on right. Go straight ahead.
- 89.4 Side road on right. Go straight ahead.
- 89.7 Turn left (to west) on to graded road, in front of church (on right).
- 90.6 STOP NO. 14. Type locality of White's Creek beds of Shoal River formation. SW $\frac{1}{4}$ Sec. 23, T2N, R18W, Walton County.

Park cars just east of bridge over White's Creek. Exposure is in a small valley about 200 feet south of road, and about 200 yards east of bridge.

Smith (136, p. 275) gives the following section for this locality:

TYPE SECTION OF WHITE'S CREEK BEDS

	<u>Feet</u>
5. Brown sand with some casts of mollusks - - - - -	2
4. Lens of compact gray shell marl containing abundant <u>Chione cyma</u> and <u>Conus waltonensis anodosus</u> . <u>Glycymeris waltonensis</u> is comparatively rare in this lens which is exposed upstream from 5 - - - - -	0 - 2
3. Below and in part equivalent to 4 is a bed of brown and yellow sand with abundant <u>Chione ceramota</u> , <u>Glycymeris waltonensis</u> , and <u>Crassatellites densus</u> -	4 - 5

Mileage

Feet

2. Gray shell marl in places indurated to form hard lumps. Fewer mollusks than the overlying beds, but contains an excellent microfauna - - - - - 2
1. Blue shell marl, the unweathered equivalent of the above. Penetrated by a short bore hole. Contains a good microfauna - - - - - 2

- - - - -

Smith found a total of 293 species of fossils at this outcrop. He listed 150 species and varieties of mollusca, three species of bryozoa, 14 species and varieties of ostracoda, and the following species of foraminifers:

Textularia "articulata" d'Orbigny
Bigenerina floridana Cushman and Ponton
Robulus americanus (Cushman)
Robulus iotus (Cushman)
Robulus americanus var. *spinosus* (Cushman)
Robulus vauhani (Cushman)
Seracenaria acutauricularis (Fichtel and Moll)
Dentalina communis d'Orbigny
Lagena clavata d'Orbigny
Lagena hexagona (Williamson)
Lagena substriata (Williamson)
Guttulina caudata d'Orbigny
Guttulina lactea (Walker and Jacob)
Guttulina lactea var. *earlandi* Cushman and Ozawa
Globulina gibba d'Orbigny
Globulina inaequalis Reuss
Polymorphine cf. *P. advena* Cushman
Nonion greteloupi (d'Orbigny)
Nonion pizarrensis Berry
Nonion glabrellum Cushman
Nonion washingtonensis Stephenson (MS)
Nonionella auris (d'Orbigny)
Elphidium poeyanum (d'Orbigny)
Elphidium advenum (Cushman)
Elphidium chipolensis (Cushman)
Plectofrondicularia mansfieldi Cushman and Ponton
Buliminella elegantissima (d'Orbigny)
Buliminella curta Cushman
Bulimina gracilis Cushman
Bulimina gracilis Cushman var.
Virgulina cf. *V. fusiformis* Cushman
Virgulina pontoni Cushman
Virgulina (*Virgulinella*) *miocenica* Cushman and Ponton
Bolivina marginata Cushman
Bolivina marginata var. *multicostata* Cushman

Mileage

Bolivina floridana Cushman
Bolivina paula Cushman and Cahill
Reussella spinulosa (Reuss)
Uvigerina peregrina (Cushman)
Angulogerina occidentalis (Cushman)
Ellipsolagena bidens Cushman
Discorbis floridana Cushman
Lamarckina atlantica Cushman
Valvulineria floridana Cushman
Eponides entillarum (d'Orbigny)
Rotalia beccarii var. *parkinsoniana* (d'Orbigny)
Cancris sagra (d'Orbigny)
Amphistegina cf. *A. lessoni* d'Orbigny
Cassidulina crassa d'Orbigny
Cassidulina laevigata var. *carinata* Cushman
Cassidulinoides bradyi Cushman
Orbulina universa (d'Orbigny)
Cibicides concentricus (Cushman)
Cibicides lobatulus (Walker and Jacob)
Dyocibicides biserialis Cushman and Valentine

Return to road at church, one mile to east, and follow paved road north (to left) to Argyle, and U. S. Highway 90 west to DeFuniak Springs.

Distance to next scheduled stop 17 miles.

- 91.6 Turn left on to road, in front of church.
- 97.2 Junction with U. S. Highway 90 at Argyle. Go west on U. S. Highway 90
- 101.6 East limits of DeFuniak Springs, county seat of Walton County.
- 102.1 Turn south on to Fla. Highway 40, in DeFuniak Springs.
- 102.8 Sharp right turn.
- 103.0 Sharp left turn.
- 103.5 Turn right on to asphalt road.
- 104.3 Turn left on to side road (hard surfaced for only about 100 yards from junction).
- 105.3 Road forks; keep to right.
- 105.8 Side road on left. Go straight ahead.
- 106.6 Road forks; take road to left.

Mileage

- 107.0 Sharp right turn in road.
- 107.3 Turn right through gate to home of Mr. Chester Spence.
- 107.5 STOP NO. 15. Exposure of Upper Shoal River in steephead at edge of cultivated field, Chester Spence farm, NE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 17, T4N, R19W, Walton County. Smith (136) gives an elevation of 125 feet for top of shell bed at this locality.

The following section is exposed: Feet

Shoal River formation (Middle Miocene)

- | | |
|--|---|
| 3. Buff, argillaceous sand - - - - - | 6 |
| 2. Bluish, compact, sandy clay - - - - - | 3 |
| 1. Shelly clay and thin layers of brown sand - - - - | 2 |

Cushman and Ponton (52) list the following species of foraminifera from this locality:

Amphimorphina sp.
 Bolivina marginata Cushman
 B. marginata multicostata Cushman
 B. floridana Cushman
 Bulimina buchiana d'Orbigny
 Buliminella curta Cushman
 B. elegantissima (d'Orbigny)
 Cameris sagre (d'Orbigny)
 Cassidulina laevigata d'Orbigny var. carinata Cushman
 Cibicides concentricus (Cushman)
 C. floridanus (Cushman)
 Chrysalidinella pulchella (Cushman)
 Dentalina communis d'Orbigny
 Dycibicides biserialis Cushman and Valentine
 Elphidium poeyanum (d'Orbigny)
 Eponides mansfieldi Cushman
 Globorotalia menardii (d'Orbigny)
 Globulina inequalis Reuss
 Hastigerina pelagica (d'Orbigny)
 Lagena marginato-perforata (Sequenza)
 Nodogenerina advena Cushman and Leimig
 Nodosaria longiscata d'Orbigny
 Nonion pizarrensis Berry
 N. grateloupi (d'Orbigny)
 Nonionella auris (d'Orbigny)
 Orbulina universa d'Orbigny
 Plectofrondicularia mansfieldi Cushman and Ponton

Mileage

Pulvinulinella pontoni Cushman
Robulus americanus (Cushman)
R. *americanus spinosus* (Cushman)
R. *iotus* (Cushman)
R. *vaughani* (Cushman)
Rotalia beccarii (Linne) var. *parkinsoniana* (d'Orbigny)
Seraceneris acutauricularis (Fichtel and Moll)
Sigmoilina tenuis (Czjzek)
Textularia articulata d'Orbigny
T. *mayori* Cushman
Uvigerina peregrina Cushman
Valvulinaria floridana Cushman
Virgulinella pontoni Cushman
V. (Virgulinella) *gunteri* Cushman
V. (Virgulinella) *miocenica* Cushman and Ponton

Distance to next scheduled stop 4.2 miles.

107.6 Turn right (to south) at gate.

Note: For the next two or three miles the road is rough and has some steep grades.

109.4 Crossroads; take road to right.

110.0 Alaqua Creek.

110.4 Sharp right Turn.

110.6 House that was accidentally bombed on right.

111.2 Home of Mr. A. H. Cosson on right. Mr. Cosson owns the farm on which is located the next locality to be visited. This farm was formerly the Frazier Farm.

111.5 Turn left on to sand road.

111.7 STOP NO. 16. Exposure in ravine on the Cosson farm, in the SE $\frac{1}{4}$ Sec. 18, T2N, R19W, Walton County. Type locality of the Yoldia waltonensis zone of the Shoal River formation.

About 6 feet of bluish fossiliferous marl is exposed at a small springhead in the ravine. Yoldia waltonensis is very abundant.

Cushman and Ponton (52) list the following species of foraminifera from this locality:

Mileage

Ampnimorphina sp.
Bolivina floridana Cushman
B. marginata Cushman
Bulinina buchiana d'Orbigny
Buliminella curta Cushman
Canceris sagra (d'Orbigny)
Cassidulina laevigata d'Orbigny var. *carinata* Cushman
Cibicides concentricus (Cushman)
Elphidium poeyanum (d'Orbigny)
Eponides mansfieldi Cushman
Globorotalia menardii (d'Orbigny)
Nonogenerina advena (Cushman and Laming)
Nonion pizarrensis Berry
Orbulina universa d'Orbigny
Plectofrondicularia mansfieldi Cushman and Ponton
Pulvinulinella pontoni Cushman
Robulus iotus (Cushman)
Uvigerina peregrina Cushman
Virgulina (*Virgulinella*) *miccenica* Cushman and Ponton

Return to graded road and follow it north to junction with U. S. Highway 90.

Distance to last scheduled stop 20.3 miles.

- 112.0 Turn left (to north) on to graded road.
- 113.1 Crossroads. Keep to right on gravel road.
- 114.1 Pleasant Ridge Church on right; school and cemetery on left.

Note: Fossiliferous beds of the Shoal River formation crop out in steepheads about $\frac{1}{4}$ mile to the west. Cushman and Ponton (5a) list the following species of foraminifera from this locality:

Bolivina marginata Cushman
B. marginata multicostata Cushman
Buliminella curta Cushman
B. elegantissima (d'Orbigny)
Canceris sagra (d'Orbigny)
Cibicides concentricus (Cushman)
Discorbis candeiana (d'Orbigny)
Dyocibicides biserialis Cushman and Valentine
Elphidium poeyanum (d'Orbigny)
Eponides mansfieldi Cushman
Nonion glabrellum Cushman
N. pizarrensis Berry
Nonionella suris (d'Orbigny)
Orbulina universa d'Orbigny

Mileage

Pulvinulinella pontoni Cushman
Robulus americanus (Cushman)
Textularia articulata d'Orbigny
T. candeiana d'Orbigny
T. sp.
Uvigerina peregrina Cushman
Virgulina (Virgulinella) gunteri Cushman
V. (Virgulinella) miocenica Cushman and Ponton

- 115.1 Crossroad. Go straight ahead (to north) across asphalted road.
117.5 Junction with U. S. Highway 90. Turn left (to west) and follow
U. S. Highway 90 to Mossyhead, 9.3 miles distant.
126.8 East limits of Mossyhead.
127.0 Turn right (to north) on to graded road in front of railroad
station.
130.4 Battle Creek. Turn right just north of bridge.
131.0 Godwin Bridge over Shoal River.

Note: Several feet of gray compact argillaceous, sparsely fossiliferous, fine sand of the Shoal River formation is exposed in the banks of the river at the bridge. A washed sample yielded common small gastropods, pelecypods, and ostracods, and the following genera of foraminifera:

Discorbis, Globigerina, Nonion, Rotelia and Valvulinaria.

This exposure is about 40 feet below the shell bed at the type locality of the Shoal River formation, about one half mile upstream from bridge.

- 131.3 Turn right (up a hill) on to a poorly kept road.
131.6 Cemetery on right.
131.8 Turn right on to a faint road through woods.
131.9 Keep to right; follow ridge.
132.0 STOP NO. 17. Shell Bluff on the north side of Shoal River, about one half mile upstream from Godwin Bridge, $3\frac{1}{2}$ miles north of Mossyhead, in NW $\frac{1}{4}$ Sec. 3, T3N, R21W, Walton County.

Cooke (41, p. 175) gives the following section:

Mileage

Feet

SECTION AT SHELL BLUFF, SHOAL RIVER

Citronelle(?) formation (Pliocene?):

- | | |
|--|----|
| 8. Gravel-covered slope; gravel ellipsoidal,
one half inch probably usual length, rarely
one inch, mostly quartz, in rather coarse
red sand - - - - - | 30 |
|--|----|

Shoal River formation (Middle Miocene):

- | | |
|--|-----------------|
| 7. Gray finer sand, blotched yellow, decidedly
argillaceous, estimated - - - - - | 10 |
| 6. Greenish shell marl, matrix arenaceous, fine
(<u>Glycymeris waltonensis</u> zone) - - - - - | 2 $\frac{1}{2}$ |
| 5. Non-fossiliferous coarser greenish sand
becoming argillaceous at base - - - - - | 3 |
| 4. Green clay - - - - - | $\frac{1}{2}$ |
| 3. Coarser sand, gray, greenish, last 2 $\frac{1}{2}$ feet loose,
purple and white - - - - - | 6 |
| 2. Unexposed - - - - - | 15 |
| 1. Non-fossiliferous green sand, oxidized yellowish
on surface - - - - - | 10 |

- - - - -

Cushman and Ponton (52) list the following species of foraminifera from this locality:

Textularia articulata d'Orbigny
 Quinqueloculina lamarckiana d'Orbigny
 Quinqueloculina costata d'Orbigny
 Robulus americanus (Cushman) var. spinosus (Cushman)
 R. iotus (Cushman)
 Marginulina glabra d'Orbigny (?)
 Dentalina communis d'Orbigny
 Dentalina consobrina d'Orbigny var. emaciata Reuss
 Dentalina sp.?
 Lagena perlucida (Montagu)
 Lagena gracilis Williamson
 Guttulina lactea (Walker and Jacob)
 Globulina inequalis Reuss
 Pseudopolymorphina dumblei (Cushman and Applin)
 Nonion grateloupi (d'Orbigny)

Milesge

Nonion pizarrensis Perry
Nonionella auris (d'Orbigny)
Elphidium poeyanum (d'Orbigny)
Plectofrondicularia mansfieldi Cushman and Ponton
Buliminella elegantissima (d'Orbigny)
B. curta Cushman
B. gracilis Cushman var.
Virgulina pontoni Cushman
V. (Virgulinella) miocenica Cushman and Ponton
Bolivina marginata Cushman
Bolivina popa Cushman and Cahill
Uvigerina peregrina Cushman
Uvigerina auberiana d'Orbigny
Valvulineria floridana Cushman
Eponides mansfieldi Cushman
Canceris segre (d'Orbigny)
Pulvinulinella pontoni Cushman
Cassidulina laevigata d'Orbigny var. carinata Cushman
Cassidulinoides bradyi Cushman
Orbulina universe d'Orbigny
Globorotalia menardii (d'Orbigny)
Cibicides concentricus (Cushman)
Dyocibicides biserialis Cushman and Valentine

PART II. STRATIGRAPHY OF THE OUTCROPPING FORMATIONS IN WESTERN FLORIDA

INTRODUCTION

Western Florida is widely known among geologists and paleontologists for its type exposures of very fossiliferous Miocene formations, for the type locality of the Marianna limestone (Oligocene), and for its many exposures of Ocala limestone (upper Eocene). Some of the localities, such as the type locality of the Marianna, are easily accessible; but many of the exposures are in sparsely settled areas and are difficult to find. The chief object of the Third Field Trip of the Southeastern Geological Society is to guide geologists and paleontologists to some of these localities so that they may be studied and sampled. There still remain to be solved many stratigraphic problems within the area to be visited, and close correlation of the formations exposed in western Florida with other areas in the Gulf and Atlantic coastal plains is a goal yet to be reached. Only by study of the type sections, and interchange of ideas based on experience in other regions can the stratigraphic problems be solved.

The Ocala limestone (upper Eocene) is the oldest formation cropping out in western Florida and thus it is the oldest formation to be observed on the field trip. However, deep wells in the area to be visited penetrated older formations, and they are discussed briefly in this guidebook.

PLEISTOCENE

Most of western Florida is underlain with a blanket of terrace materials (sand, some gravel, and some mottled sandy clay) which may have

been deposited when the Pleistocene ice sheets melted. The surfaces of these deposits stand at various levels above the sea, and the highest surface may correspond in age to the earliest interglacial stage. Some geologists, notably Cooke (41), believed these deposits were laid down in a sea and are thus marine. No marine fossils have been found in the Pleistocene except near the present coast so that a marine origin for the deposits is not proved. It appears probable that the flooded streams of the interglacial stages blanketed the region with deltaic and alluvial deposits. Such deposition could form level surfaces as those in western Florida.

The Pleistocene is, of course, absent where older formations crop out. In some areas the Pleistocene deposits are at least 100 feet thick. An erosional unconformity sharply separates these deposits from the underlying Miocene and older beds.

PLIOCENE

It is possible that most of the deposits mapped as Citronelle (Pliocene) are of the same age and origin as the Pleistocene terraces, and these deposits were included in the discussion of the Pleistocene. Possibly the only Pliocene in western Florida is a thin wedge of marine sand near the present coast. If this is true then most of the area under consideration was probably being eroded rather than receiving deposits during Pliocene time.

MIOCENE

General Statement

Highly fossiliferous beds of upper, middle, and lower Miocene age

crop out in western Florida. The fossils have been studied by many paleontologists, so that this area is regarded by many as the "type" for much of the Gulf-Caribbean region. The mollusks have been studied by Gardner (72, 73) and Mansfield (94, 95, 96, 99, 102); the bryozoa by Canu and Bassler (14); the ostracodes by Howe et al. (84) and R. H. Smith (136); and the foraminifera by Cushman (43, 46, 50, 51), Cushman and Ponton (52), R. H. Smith, and others.

Faunal zones in the Miocene have been recognized and named from the molluscan fauna present. The following divisions of the Miocene are present in western Florida:

Duplin marl (late Miocene)

Cancellaria zone (named from C. propevenusta Mansfield).

The Type locality of this zone is Jackson Bluff on the Ochlockonee River, Leon County, Fla.

Eophora zone (named from E. quadricostata umbilicata (Wagner)).

The type locality of this zone is Alum Bluff on the Apalachicola River, Liberty County, Fla. (Stop 2).

Shoal River formation

Arca rubisiniensis zone. Type locality of this zone is in the vicinity of Red Bay, Walton County, Fla. (Stop 13).

Yoldia waltonensis zone. Type locality of this zone is an exposure on the A. H. Cossin farm, Sec. 18, T.2N, R. 19W, Walton County, Fla. (Stop 16).

Glycymeris waltonensis zone. Type locality is Shell Bluff on Shoal River, Walton County, Fla. (Stop 17).

Cardium taphrium zone. Type locality is the same as for the Oak Grove sand (now included in the Shoal River formation), bed and bank of Yellow River near Oak Grove, Okaloosa County, Fla.

Chipola formation

Tampa limestone (early Miocene)

The two zones in the Duplin marl occur, at Jackson Bluff, Leon County, within a thickness of about 16 feet, so that not much thickness, and possibly not much difference in age is involved. The four zones in the Shoal River formation may represent four shell beds, though it is possible that some or all are equivalent.

In western Florida the upper Eocene and Oligocene deposits are mainly

limestone, free of clastic material. But at the beginning of Miocene time sedimentary conditions changed so that sand and clay were included in the Tampa limestone, and they became the dominant elements in middle and upper Miocene deposits.

In the Mississippi River Delta region, where sedimentation was probably continuous throughout Miocene time, deep wells have penetrated at least 10,000 feet of Miocene sediments. Foraminiferal zones established for the thin western Florida section can be recognized in the greatly expanded Louisiana section.

Duplin marl.

Cooke (41) uses the name Duplin marl for the Cancellaria and Ecphora zones (upper Choctawhatchee), and he places in the Shoal River formation the Arca and Yoldia zones (lower Choctawhatchee). The name Duplin is from Duplin County, North Carolina. Inasmuch as this formation has not been traced continuously into western Florida, it may be unwise to drop a name so well established in Florida literature as Choctawhatchee and substitute for it an east coast name, especially as beds of late Miocene age are absent in much of the area between North Carolina and western Florida. However, Cooke has placed the upper-middle Miocene contact at what appears to be the logical place.

The general character of the Duplin can be seen at Stops 2 and 3. It will be noted that much of the formation is not a marl, and that silty and sandy beds are dominant. The shell bed or beds are the most prominent and best known part of the formation, however.

The shell beds in the Duplin have abundant and varied mollusks. Oysters and other shallow water marine forms are prominent. The foraminiferal

fauna is also characteristic of shallow water. Many of the species occur in the older Miocene formations, and some are now living in the Gulf of Mexico.

Shoal River formation

The type locality of this formation is Shell Bluff on Shoal River, Walton County, Fla. (Stop 17). There clay with abundant molluscan shells (Glycymeris waltonensis zone) is overlain and underlain by argillaceous sand. It may be that this shell bed becomes thicker to the south and is actually equivalent to the fossiliferous beds exposed near Red Bay (Stop 13), on Whites Creek (Stop 14), on the Chester Spence farm (Stop 15), on the Cosson farm (Stop 16), and to the shell marl exposed at the type locality of the Oak Grove sand. Should this interpretation be correct, there is only one highly fossiliferous zone in the Shoal River formation, with more sandy beds above and below. The variations in faunas at various localities may be due to environment rather than to difference in age. The foraminiferal faunas in samples from most of the Shoal River localities are similar.

An unconformity separates the Shoal River formation from the Duplin marl above. This is indicated by a sharp lithologic and faunal change. Downward the Shoal River grades, faunally and lithologically, into the Chipola formation.

Possibly 100 feet of Shoal River outcrops, but the formation thickens downdip.

Chipola formation

The type locality of this formation is on the west bank of the Chipola River on the John M. P. McClelland farm, in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 8, T1N., R.9W., Calhoun County, Fla. The exposures on Ten Mile Creek near Fla. Highway

84 (Stop 4) are typical of the formation. The exposure on Holmes Creek, in Washington County (Stop 12), may be a different facies of the Chipola shell marl, or the exposure may actually be Tampa. The upper sandy part of the Chipola and, at low water, a shell marl, are exposed at Alum Bluff (Stop 2).

The upper part of the Chipola formation is dominantly sand at the outcrop. The well known shell marl is near the base of the formation; and apparently this grades downward into the Tampa limestone.

The molluscan fauna of the Chipola shell marl is very abundant and varied. Foraminifera are also abundant, but miliolids, characteristic of shallow water marine deposits, dominate.

The Chipola formation is probably conformable with the Shoal River formation above and with the Tampa limestone below. Thus the upper and lower limits of the Chipola are difficult to determine, and the thickness of the formation can not be easily ascertained. Probably less than 100 feet of the formation outcrops, but more than 200 feet have been penetrated by wells in the lower Apalachicola River region. Sands, which dominate in outcrop Chipola, apparently pass down-dip into marls. In westernmost Florida the Chipola either is missing or is indistinguishable from the very sandy Tampa-Paynes Hammock.

Tampa limestone

The type locality of the Tampa limestone is in the vicinity of Tampa, Hillsborough County, Fla. The formation crops out in an almost continuous belt from the Apalachicola River west through Calhoun, Washington, and Holmes Counties. The "Chattahoochee limestone" (type locality is Stop No. 1 of the field trip) was included in the Tampa limestone in 1936.

The Tampa limestone in western Florida is dominantly white, sandy, argillaceous, fossiliferous limestone, but some beds of whitish and greenish clay and argillaceous sand are also present; especially in the area of outcrop. Mollusca are abundant in some of the limestone beds. Foraminifera are represented by abundant miliolids and the genera Archaias and Sorites.

The formation may reach a thickness of 200 feet or more in the Apalachicola River area, but it is thinner to the east and west. The Tampa is correlated with the Paynes Hammock sand of southwestern Alabama and with the Trent marl of North Carolina.

OLIGOCENE

General Statement

Lower, middle, and upper Oligocene limestones crop out in western Florida. The Marianna limestone will be seen at the type locality of the formation (Stop 6); the middle and upper Oligocene (undifferentiated) will be seen at Stops 7, 9, 10, and 11.

In the Apalachicola River area the Oligocene is covered by younger sediments, but in north-central Florida the Suwannee limestone (Oligocene) is at the surface. The fauna in the Suwannee is so different from that in the Oligocene west of the Apalachicola River that an exact correlation is difficult.

An unconformity probably separates the Oligocene from the Miocene, though Mansfield (104) found many molluscan species present in both the Tampa limestone (Miocene) and the Suwannee limestone (Oligocene). The Oligocene limestones are generally free of quartz grains whereas the Tampa limestone typically sandy. Lepidocyclina ranges up through the Oligocene, but the genus

has not been recorded from the Miocene of Florida. Micogypsina is apparently restricted to the Oligocene in Florida. Operculinoides spp. are abundant in Oligocene limestones in western Florida, but the genus is also present in the Miocene marls and limestones.

The Oligocene is believed to lie unconformably on the Ocala in western Florida, though the contact could probably not be determined by lithology. At the outcrop the lower Oligocene limestone (Red Bluff equivalent?) is hard and glauconitic. This lies on soft, granular, non-glauconitic Ocala limestone, so that a lithologic change is noted. But in the sub-surface these distinguishing characteristics are absent, and the Oligocene-Eocene contact is determined mainly by fossils.

Upper and Middle Oligocene

Equivalents of the Byram formation (including the Glendon member) and the Chickasawhay limestone are present in western Florida, but they are not easily differentiated. Bernon (151, p. 59) in his report on Holmes and Washington Counties used the term Suwannee limestone to include "all limestone beds lying below definite Tampa formation and above definite Marianna limestone." MacNeil (94, p. 1315) shows only the Chickasawhay to be equivalent to the Suwannee. By this correlation the middle and lower Oligocene are absent where Suwannee lies directly on Ocala. Cooke (41) recognizes Suwannee in western Florida and (p. 88) he states, "Its equivalent in western Alabama and in Mississippi is the Chickasawhay limestone."

Deposits of Oligocene age are apparently missing along the east coast of Georgia and the northern part of the east coast of Florida. So it is possible that in the type area of the Suwannee limestone (Suwannee River between Ellaville and White Springs) only the upper part of the Oligocene is represented. On the other hand, it is possible that Suwannee of the type area

is in part older than upper Oligocene. Until a correlation is more definitely established it is probably unwise to extend the use of the name Suwannee into western Florida.

In Southwestern Alabama the upper and middle Oligocene formations are about as follows:

Chickasawhay limestone. Soft, whitish marl with abundant small foraminifera.

Byram formation

Marl member. Soft, buff to gray, glauconitic marl with abundant bryozoa and large and small foraminifera. Lepidocyclina supera, Operculinoides muii, etc.

Glendon limestone member. Hard, cream-colored, glauconitic limestone. Lepidocyclina favosa, L. undosa, L. supera, Operculinoides (several species).

In western Florida the above lithologic divisions can not be recognized, and little faunal differences can be noted. Several species of Lepidocyclina and Operculinoides are abundant throughout the section. It is possible that subdivisions could be made from careful study of the foraminifera, bryozoa, or ostracods.

Marianna limestone (includes Red Bluff equivalent)

This formation was named from the city of Marianna, Florida, where the entire thickness of the formation is exposed. The type locality is at the east edge of Marianna (Stop 6). The lower hard, glauconitic part of the formation with Lepidocyclina fragilis is correlated with the Red Bluff by MacNeil (94), though he later states (personal communication) that "I have recently come to believe that the Lepidocyclina fragilis zone has more to do with the Mint Spring than the Red Bluff".

The Marianna has been traced westward across Alabama and Mississippi. However, the type locality of the formation is near its eastward known ex-

tension, though its equivalent may be present in the sub-surface in southwestern Georgia and north-central Florida.

The upper half of the Marianna includes the "chimney rock" - soft, white to cream-colored, granular, porous, massive limestone with abundant Lepidocyclina mantelli. This limestone is easily sawed into blocks which harden on drying, and it has been quarried for use as a building stone, especially for building chimneys, in Florida, Alabama, and Mississippi. This lithologic character helps to distinguish the Marianna from the limestones above and below. However, the Byram limestone, above, may have similar massive beds, as can be seen in the quarry near Duncan Church, Washington County (Stop 11).

The thickness of the Marianna limestone (including the Lepidocyclina fragilis zone) is about 38 feet at the type locality of the formation. Many shallow wells in western Florida have penetrated the Marianna, but in most cases the formation has not been separated from the younger Oligocene limestones.

UPPER EOCENE

General Statement

In southwestern Alabama the upper Eocene is made up of several units, as follows:

Marl (Zeuglodon bed). Soft, whitish marl with very abundant small foraminifera and the following large foraminifera: Asterocyclina cf. chipolensis, Aktinocyclina sp., Pseudophragmina citrensis, Lepidocyclina ocalana, Operculinoides ocalanus, O. mariannensis.

Cocoa sand. Fine-grained, argillaceous, calcareous sand with abundant ostracodes and common shallow water marine foraminifera. This grades downward into

Sandy clay (tongue of Yazoo). Ostracods and small foraminifera are common. Some characteristic species are: Amnobaeculites cf. hockleyensis, Textularia adalta, and Glendulina sp.

Moodys marl. Coarse, glauconitic, marly sand with Camerina jacksonensis, C. moodybranchensis, Gypsina globula, Lepidocyclina mortoni, etc.

Gosport sand. Loose to indurated, glauconitic, calcareous, fossiliferous sand and some brown clay. Mollusca are abundant in the lower part of the formation. Foraminifera are rare, and the species are similar to those in the Cocoa sand.

Eastward the upper marl, Cocoa sand, and sandy clay grade into limestone to become the Ocala. The Moodys marl extends eastward into Florida with little change in character and thickness. The Gosport is difficult to separate from the Moodys in western Florida. In the Tallahassee area the equivalent of the Gosport may be as much as 1,000 feet thick.

Ocala limestone

This formation was named for the city of Ocala, Marion County, Florida. Cooke (21), in 1915, recognized that the age of the Ocala is upper Eocene, and he correlated it with the Jackson.

The Ocala in peninsular Florida is typically soft granular fossiliferous limestone with an average thickness of about 200 feet. In western Florida the Ocala limestone is similar lithologically and faunally, and its thickness is 100 to 200 feet. The limestone is porous and easily dissolved, forming numerous caverns.

Some characteristic fossils of the Ocala limestone are: Amusium ocalanum, Asterocyclina (several species), Operculinoides ocalanus, and Heterostegina ocalana.

Only the upper part of the Ocala limestone will be seen on the field trip, at Stops 6 and 8.

PART III. THE SUBSURFACE STRATIGRAPHY OF WESTERN FLORIDA

INTRODUCTION

The following represents an attempt to summarize briefly the available knowledge of unexposed formations west of the Apalachicola River, as they are recognized in well samples.

Many subsurface formations vary considerably in character both from west to east and from their surface expressions up into Alabama. For these reasons, and because of insufficient deep well control in western Florida and southern Alabama, there are doubtless many errors in the descriptions, thicknesses and correlations presented below. Nevertheless, it is felt that a discussion of subsurface stratigraphy is not inappropriate to the present guide book, inasmuch as the oil and gas possibilities of the deeper formations are of particular interest to petroleum geologists.

The following discussion is based principally on sample and electrical log studies of the following deep tests:

- (1) Geometer Producing Co. #1 Walton Ld. & Timber, Sec. 12-T1N-R19W, Walton County, T.D. 5,375'.
- (2) Chipley Oil Co. #1 Dekle, Sec. 27-T4N-R13W, Washington County. T.D. 4,912'.
- (3) Mamie Hammond #1 Granberry, Sec. 15-T5N-R9W, Jackson County. T.D. 5,022'.
- (4) Magnolia Petroleum Co. #1 State, Sec. 21-T3S-R15W, Bay County, T.D. 7,003'.
- (5) Pure Oil Co. #1 Hopkins, Sec. 22-T6S-R9W, Gulf County. T.D. 8,708'.

Additional deep tests have been drilled in western Florida,

but the above are the only ones on which stratigraphic information is available to date.

Additional subsurface information was procured from numerous shallower tests in the subject area and from deep oil tests in adjoining areas. By means of these latter the western Florida section may be correlated with formational units to the west in southwestern Alabama, Mississippi, and the western Gulf Coastal States; to the north in southeastern and central Alabama, where most of the units outcrop; and to the east and northeast in north central Florida and southern Georgia.

In the ensuing paragraphs the general term "updip" refers to the nearer shore formational facies as observed in wells in Walton, Okaloosa, Washington and Jackson Counties. "Downdip" refers to the generally deeper water facies found in Bay and Gulf County wells. The lateral variations are depicted graphically in the columnar section accompanying this report, together with the series, group and formation names, the estimated thicknesses, a brief generalized description of the lithology of each formation, and a few key fossils for each unit where present. The maximum, minimum and average thicknesses are computed on the basis of all available sources.

EOCENE SERIES

Claiborne Group

General Subdivisions. -- The Claiborne Group in western Florida is subdivided into the Lisbon and Tallahatta formations in accordance with usage in Alabama. The overlying Gosport formation

also was formerly included in the Claiborne, but is now generally considered lower Jackson in age. The Lisbon and Tallahatta in Florida form two fairly distinct lithologic units. Both are made up predominantly of glauconitic sands, but the Lisbon or upper unit is generally quite calcareous, whereas the underlying Tallahatta is more glauconitic and less calcareous. There is apparently no sharp lithologic break between the two formations, the Lisbon becoming increasingly glauconitic toward its base and grading into the Tallahatta.

Lisbon Formation

Lithologic character. -- The updip facies of the Lisbon consists primarily of glauconitic calcareous sand, hard sandy glauconitic limestone, and soft sandy glauconitic marl grading to sandy chalk, with lesser amounts of glauconitic sandy shale and brown crystalline limestone. The limestones generally decrease and the glauconite content increases toward the base.

Downdip in Bay and Gulf Counties, the Lisbon is represented by an apparently deeper water facies consisting principally of white sparingly glauconitic frequently cherty limestone, cream-colored fragmental limestone and light gray fossiliferous partly bentonitic clay, with minor amounts of soft white chalky pyritic and light gray limestone, and calcareous sandstone. In Gulf County the limestones are partially dolomitized and the formation becomes increasingly argillaceous toward the base.

Thickness. -- The Lisbon ranges in thickness from approximately 300 feet in Bay County to 430 feet in Jackson County, with an

estimated average for the entire area of approximately 375 feet.

Key fossils. -- The upper calcareous phase of the Lisbon carries a rather abundant microfauna, of which the following are some common species: Polylepidina gardnerae, Camerina mississippiensis, Ceratobulimina eximia, Eponides yeguaensis. The lower less calcareous phase carries a somewhat older assemblage of which Asterigerina texana is typical.

Tallahatta Formation.

Lithologic character. -- The updip facies of the Tallahatta is composed principally of glauconitic sand, interbedded in some areas with light green siliceous claystone and minor quantities of white sandy glauconitic limestone. In Okaloosa and Walton Counties hard siliceous claystone beds resembling the characteristic Tallahatta "buhrstone" of Mississippi are common, but these apparently lens out to the east so that in Jackson County the formation is almost entirely pure loose glauconitic quartz sand.

Downdip in Bay and Gulf Counties the glauconitic sands grade into glauconitic limestones, frequently siliceous, with minor amounts of gray calcareous clay. In Gulf County much of the lower Tallahatta limestone is extremely cherty and less glauconitic than the updip facies.

Thickness. -- The Tallahatta varies in thickness from 175 feet in norther Okaloosa County to nearly 500 feet in Gulf County. The formation appears to increase steadily in thickness to the east, so that in Gulf County it comprises about two thirds of the Claiborne

Group in contrast to Okaloosa County where it forms only about one third.

Key fossils. -- No typical guide fossils are known for the Tallahatta. Sponge spicules, radiolaria, and molds of small gastropods are common in the siliceous portions.

Regional correlation of the Claiborne Group

The upper calcareous part of the Lisbon is believed to be equivalent to the Cook Mountain formation of Louisiana and the Wautubbee of Mississippi. The lower glauconitic phase is probably correlative with the Winona greensand of Mississippi and the upper part of the Cane River of Louisiana. The Tallahatta is apparently the same age as the Tallahatta of Alabama and Mississippi; farther west it correlates with the basal Cane River of Louisiana and the Reklaw of Texas.

To the east, the Lisbon is correlated with the Lake City limestone of peninsular Florida. The overlying Tallahassee and Avon Park formations, formerly included in the Claiborne Group, may be of early Jackson age. The Applins, (3) in discussing the clastic facies of the Claiborne do not mention the Tallahatta, but divide the Lisbon into an upper calcareous and a lower glauconitic phase. Cooke (41) states that the clastic facies of the Claiborne in Florida is presumably equivalent to the Tallahatta and Lisbon formations combined. Hence it seems probable that at least part of the lower glauconitic beds of Claiborne age in west Florida correlate with the Tallahatta as described above.

Wilcox Group

General Subdivisions. --- No attempt has been made to subdivide the Wilcox Group into separate formations in western Florida. The group probably contains, at least in the western portion of the area, the downdip equivalents of the Hatchetigbee, Bashi, Tuscahoma, Nanafalia, and possibly the Ackerman formations of Alabama; but inasmuch as these surface units cannot be traced into the sub-surface with any certainty even in southeastern Alabama near the outcrop, it is virtually impossible to differentiate them in western Florida.

It is possible, however, to make two broad and generalized divisions of the subsurface Wilcox on the basis of lithology and paleontology. The upper of these divisions is a shallow water marine or continental phase consisting mainly of sand and greenish colored shale; the lower unit contains much more calcareous marine beds and includes the Salt Mountain limestone where the latter is present.

Lithologic character. --- Updip in Jackson, Washington and Okaloosa Counties the upper unit consists primarily of soft greenish gray sticky shale, grading to the northwest into gray green micaceous sandy clay and glauconitic calcareous lignitic sand with minor beds of white glauconitic limestone. The lower Wilcox division in the same areas is represented by less argillaceous, more calcareous and sandy beds, becoming increasingly calcareous with depth until they grade into chalky marl at the base. The lower part of this unit contains a chalky white highly fossiliferous limestone bed of varying thickness which is correlated with the Salt Mountain limestone of Alabama.

Downin, the two-fold division of the Wilcox is less apparent, probably because the group as a whole is made up of deeper water marine beds than those farther north. In Bay and Walton Counties the upper unit consists of sandy glauconitic cherty cream-colored to gray-white or buff limestone grading downward into gray glauconitic calcareous sand. The lower unit consists of white chalky limestone and gray to green micaceous shale. In Gulf County the sand in the upper Wilcox grades into sandy limestone, whereas the lower limestones and shales are represented by chalky to dense cherty partly siliceous limestone. The lower marly portion of the Wilcox and the Salt Mountain limestone which are believed to be present in Walton and Bay Counties, appear to be missing in Gulf County, causing the Wilcox Group as a whole to thin greatly in the southeast.

It is interesting to note that in southeastern Alabama, not far north of the updip portion of western Florida, the lower calcareous phase of the Wilcox becomes increasingly dominant, so that in Houston and Dale Counties the Wilcox Group is made up principally of hard white to soft marly limestone. The upper part of the Midway also apparently interfingers into limestone in southeastern Alabama, so that the Salt Mountain formation loses its identity and it becomes difficult to pick the Midway-Wilcox contact. This upper Midway limestone is believed to correlate with the outcropping Clayton limestone, which would suggest that the Clayton is upper rather than basal Midway, as it has hitherto been classified. These highly calcareous facies of the Lower Wilcox and Upper Midway appear to persist northwesterly along

the regional strike through portions of Coffee, Covington, Pike, Crenshaw and Butler Counties, Alabama, but diminishes rapidly downdip to the southwest by interdigitation with clastic shales and sands.

Thickness. -- The thickness of the Wilcox Group range from around 380 feet in Gulf County to 1700 feet or more at the western edge of the State. This extreme thinning to the southeast is probably in part depositional, due to the transition from clastic to non-clastic beds, although as mentioned above the basal Wilcox beds in Gulf County may be absent by erosion or non-deposition.

The Salt Mountain limestone member varies in thickness from probably absent in Gulf County to possibly as much as 240 feet in Washington County. However, all of the basal Wilcox limestone in Jackson and Washington Counties may not be Salt Mountain, for the reasons noted previously in the discussion of the lower Wilcox of Alabama. The Salt Mountain in Walton and Bay Counties ranges from 70 to 90 feet in thickness, and the average for the entire area is estimated at around 125 feet or less.

Key fossils. -- The shaly portions of the Upper Wilcox contain an abundant microfauna characterized by such species as Globorotalia wilcoxi, Eponides lotus, Robulus wilcoxensis and Hemicristellaria hatchetigbeensis. A prominent bed of hard glauconitic limestone containing Bathysiphon fragments has been noted near the top of the Wilcox in the northwestern part of the panhandle, and this bed is apparently quite persistent over a large part of northwestern Florida and southeastern Alabama.

Some characteristic foraminifera in the calcareous lower

Wilcox unit, including the Salt Mountain, are Discocyclina blanniedi, Robulus midwayensis, Nodosaria affinis, and Vaginulinopsis brantlyi.

Regional correlation of Wilcox Group.

The Wilcox group in the western portion of the area under consideration is believed to contain equivalents of virtually all the formations which comprise the group at the surface in Alabama, although as stated previously no attempt has been made to trace individual formations into the subsurface. The group as a whole is apparently equivalent to the undifferentiated subsurface Wilcox of Mississippi, Louisiana and Texas. The undip shaly phase is lithologically similar to the Upper Wilcox found in wells on the Wiggins or Stone County Ridge in southeastern Mississippi, and suggests similar conditions of deposition. The non-clastic facies of the Wilcox as described in Gulf County is thought to be mainly equivalent to the Oldsmar limestone of peninsular and northeastern Florida. As noted previously, the lower unit of the Wilcox, including the Ackerman and Salt Mountain equivalents, may be largely missing in the Gulf County well.

PALEOCENE SERIES

Midway Group

General Subdivisions. -- The Midway Group, like the Wilcox, has not been subdivided into formations in western Florida. However, it is possible to make a generalized two-fold division of the Midway. The boundaries of these units do not correspond to the formational divisions of the Midway in Alabama (Neheola, Porter's Creek and "Clayton"), but appear to be equivalent only to the upper part of the Midway Group.

Lithologic character. -- Undip and in the western part of this area the upper unit of the Midway consists of light gray to

greenish gray calcareous finely sandy to silty fossiliferous partly micaceous shale with thin beds of white chalky limestone. These beds grade conformably into the lower unit, which is made up primarily of gray marly clay and fossiliferous marl.

Downdip in Bay and Gulf Counties the upper portion is lithologically similar to the above, but the lower unit is somewhat less calcareous, consisting of soft dark gray to black micaceous shale, in part characteristically speckled or banded, grading to the southeast into shales of a pale olive green to dirty pink color. This lower portion in the downdip wells is easily distinguishable on the electrical logs.

As noted in the discussion of the Wilcox Group, the upper Midway in southeastern Alabama forms an unbroken limestone sequence with the overlying beds of Lower Wilcox age, a circumstance which tends to support the theory that the Lower Wilcox and Upper Midway, at least in that area, form a single conformable lithologic unit. The same condition is noted to the east in wells in Wakulla and Leon Counties, Florida. Unfortunately, no diagnostic species have been noted in the limestone facies in Alabama, so as yet it has not been determined whether or not the Midway and Wilcox form a continuous paleontologic sequence in that area.

Thickness. -- The Midway Group thins rapidly from west to east, from a total of about 600 feet in Walton County to 260 feet in Washington and 287 feet in Gulf County. The thinning is thought to be principally due to non-deposition of the Lower Midway with the upper portions progressively overlapping the younger from west to east. The

upper unit varies from 80 to 290 feet in thickness, and the lower from 115 to 330 feet.

Key fossils. -- The foraminifera found in the Midway in western Florida are similar to those in the overlying calcareous phase of the Wilcox, particularly in the Salt Mountain lime. The fauna includes many species found in the Velasco of Mexico. Some characteristic forms are Globorotalia velascoensis, G. membranacea, Clavulinoides midwayensis and Parrella expansa.

Regional correlation of Midway Group

It is difficult to correlate the Midway in western Florida with beds farther west and outcropping to the North. The best available evidence suggests that only the upper units carry through from the west and that the lower part of the section is progressively overlapped to the east, probably as a result of non-deposition of the lower beds. If this is the case, the upper silty phase of the Midway in western Florida may be equivalent to the Naheola formation of Alabama and the lower calcareous shaly portion to the Porter's Creek clay. To the east, in peninsular and northeastern Florida, the Midway Group may be represented in the Cedar Keys limestone of Cole.

UPPER CRETACEOUS SERIES

Beds of Navarro Age

General Considerations. -- Beds of Navarro Age are known to be present in southern Alabama, and it is probable that some material of that age is present at least in the western portion of the area under consideration. The Apolins (3) refer to the Navarro approximately 75 feet of light gray chalky marl found in a well in Walton County and some 30

feet of similar material in Washington County. Judging by the electric log there may be as much as 130 feet of Navarro chalk in Walton County. However, these beds apparently thin out and disappear east of Washington and Walton Counties, and are believed to be absent in Bay, Gulf and Jackson Counties.

A fossil characteristic of the Navarro in Alabama and Georgia wells is Siphogenerinoides plummeri. Its apparent absence in western Florida may be due to the fact that the uppermost Cretaceous material in this area may be too calcareous for this species. It is interesting to note that wells in southeastern Alabama not far north of the area in question have penetrated more than 400 feet of sandy and shaly beds of Navarro age.

Beds of Taylor Age

Distribution and Lithologic Character. -- Beds of Taylor age are thought to be present over all of western Florida, but the thickness of the unit varies. The lithologic character is apparently fairly uniform throughout. Upward the beds are hard gray marl with interbedded lenses of gray limestone and light gray, gray-green and blue-gray partly calcareous and micaceous shale, with a little sand. Downward, the Taylor is represented by dirty gray shaly chalk interbedded with olive green shale, and soft white to gray chalky marl.

Thickness. -- The Taylor beds thin very rapidly from an estimated 750 feet or more in extreme western Florida to 350 to 400 feet in Washington and Jackson Counties. This thinning is thought to be due either to truncation or non-deposition of the upper part of the group, probably as a result of a large scale uplift during late Cretaceous

and early Paleocene time.

Key fossils. -- Some diagnostic foraminifera found in beds of Taylor Age in western Florida are Planulina taylorensis, Stensioina americana, Bolivinoidea decorata, and Gyroldina micheliniana.

Regional Correlations of Navarro and Taylor Beds.

The Navarro and Taylor equivalents in western Florida have not been definitely subdivided to date. The Navarro beds are equivalent to the upper part of the sandy near-shore Ripley formation, and the Taylor is partially equivalent to the Selma chalk. However, recent field and subsurface studies in Alabama and Mississippi indicate that the lower, perhaps the greater portion of the Selma Group, is of Austin Age. Surface subdivisions of the Ripley and Selma, such as the Providence sand, Cusseta and Blufftown formations, etc., are thought to represent mainly local near-shore facies, and they cannot be traced with certainty very far downdip into the subsurface. To the west the Taylor and Navarro beds are correlated with the same groups in Texas, Arkansas and Louisiana.

Beds of Austin Age

Lithologic character. -- The beds of Austin Age in western Florida are lithologically variable. In the western part of the area composed mainly of gray marl and marly and chalky limestone. In the east the unit updip consists of fine to coarse glauconitic micaceous sand with green or greenish gray calcareous shale; downdip, of flaky gray or greenish gray fissile shale with considerable chalk and marl. The chalky portions show up prominently on electrical logs, but appear to lens in and out laterally; hence

they form a satisfactory marker for general regional correlation, but not for detailed structural mapping. In most wells one or more layers of a characteristic marly brownish-gray white-spotted or "speckled" shale are found in the lower half of the unit, between the base of the chalk and the top of the Eagle Ford.

Thickness. -- The Austin Group ranges in thickness from around 350 feet in Walton County to 460 feet in Jackson County. The average thickness for west Florida is estimated at approximately 440 feet.

Key fossils. -- Fish remains are common near the base of the Austin Group and a characteristic microfauna is usually present throughout. Some characteristic species in the latter are Vaginulina texana, Kyphonyxa christneri, Pseudogaudryinella capitosa, Pseudo-clavulina moorevillensis, and Globorotalia subconica.

Regional correlation of Austin Group.

Beds of Austin Age in western Florida are equivalent to the Austin chalk of Texas and north Louisiana and peninsular Florida. In Alabama and Mississippi it is correlated with the lower part of the Selma Group and the upper part of the Eutaw. The chalky phase of the Austin is believed to be equivalent to the Tombigbee sand member of the Eutaw. The chalk tongue can be traced westward in the subsurface across Mississippi and Louisiana into the Ector tongue of the Austin in East Texas.

Tuscaloosa Group

General Subdivisions. -- The Tuscaloosa Group in western

Florida is divided into three parts, termed the upper, middle and lower Tuscaloosa. The thickness of the group varies from approximately 1100 to 1600 feet.

Upper Tuscaloosa - Eagle Ford

Lithologic character. -- This unit in west Florida has two distinct facies. Updip and in the west it consists chiefly of shallow water marine or continental sands, typically fine-grained, silty, argillaceous and micaceous, with lesser quantities of interbedded shale. These beds are generally finer and less gravelly than their upper Tuscaloosa equivalents in western Alabama and Mississippi. The red shales and siderite pellets which characterize the upper Tuscaloosa further west and north are weakly developed or absent in western Florida.

Downdip in Bay and Gulf Counties the Upper Tuscaloosa sands grade into marine material which bears a strong lithologic and faunal similarity to the Eagle Ford formation of Texas. At the top are fine glauconitic sands, but the bulk of the unit consists of laminated gray to greenish-gray micaceous glauconitic, frequently carbonaceous, marine shale, with scattered layers of dark brown to black thinly laminated light speckled shale. The transition from upper Tuscaloosa sands in Walton County to Eagle Ford shale in Bay and Gulf Counties is by a gradual process of interfingering, and there is little doubt that the two are of the same age.

Key fossils. -- The Eagle Ford facies of the Upper Tuscaloosa contains fragments of shallow water bivalves throughout, and

carries a characteristic Eagle Ford micro-fauna. The following foraminifera are usually present: Planulina eaglefordensis, Vaginulina texana var., Epistomina sp., Anomalina sp. (small), and Ammobaculites sp. (small, slender).

Thickness. -- The thickness of the Upper Tuscaloosa - Eagle Ford unit varies from 400 feet in Gulf County to 510 feet in Washington County, with an estimated average of around 500 feet. The unit thins somewhat downdip and to the east.

Middle Tuscaloosa.

Lithologic character. -- The middle portion of the Tuscaloosa includes the unit commonly known as the "marine shale" and a lower marine sand which may correlate with the "transitional" zone of Mississippi and western Alabama. These beds appear to be present over all of western Florida and throughout the entire Gulf and Atlantic Coastal Plains, with the exception of parts of the Florida peninsula and places where they are overlapped undip. The middle Tuscaloosa is predominantly gray to black irregularly micaceous shale with a characteristic greasy luster and thin beds of fine glauconitic sand. Shell fragments and carbonaceous material are sometimes present. The lower marine sand is medium to fine grained and glauconitic.

Thickness. -- The thickness of the middle Tuscaloosa ranges from around 250 feet in Washington County to 375 feet in Walton County. The unit appears to thicken somewhat downdip, although this may be due to faulty correlation, since it is difficult to separate the marine shale from the Upper Tuscaloosa in areas

where the latter is represented by the Eagle Ford shale facies. The average thickness is estimated at around 275 feet, although it may be somewhat less.

Key fossils. --- The Middle Tuscaloosa has a poor and little known fauna, including small thin-shelled ostracods and the following species of foraminifera: Ammobaculites sp. (broad), Globigerina cretacea, Globotruncana sp., Gumbelina sp.

Lower Tuscaloosa.

General Considerations. -- The lower unit of the Tuscaloosa appears to be non-marine. It is composed chiefly of poorly sorted fine to very coarse micaceous frequently kaolinitic (?) sand, interbedded with a small amount of shale. There is no pronounced lithologic break in western Florida between the lower Tuscaloosa and the underlying Lower Cretaceous beds, with the result that it is difficult to pick the contact between the Lower and Upper Cretaceous Series. For this reason it is not possible to make an accurate estimate of the thickness of the lower Tuscaloosa unit. So far as is known, no marine fossils have been noted from the Lower Tuscaloosa in western Florida.

Regional Correlation of Tuscaloosa Group.

The upper Tuscaloosa is thought to be equivalent to the Eagle Ford of east Texas and north Louisiana, and to the non-marine upper portion of the Tuscaloosa in Mississippi, Alabama, Georgia and the northern Atlantic Coastal Plain. The marine Eagle Ford facies apparently continues eastward into Southern Georgia and peninsular Florida. This facies is also typically developed over the

Wiggins (Stone County) Ridge in southeastern Mississippi, a relationship analogous to that previously described for the upper part of the Wilcox group. The Upper Tuscaloosa in west Florida presumably includes the downdip equivalents of the Gordo and Coker formations of Alabama.

The middle Tuscaloosa marine shale apparently is present wherever the Tuscaloosa is typically developed, having been encountered in the subsurface of the Coastal Plain from North Central Louisiana to New Jersey. The middle Tuscaloosa at the outcrop in west central Alabama has been called the Eoline Formation.

The lower Tuscaloosa is thought to be equivalent to the "massive" sand of Mississippi and Louisiana, and to the upper part of the Woodbine of Texas. At least part of this unit may be equivalent to the Cottondale formation, on the outcrop in Alabama.

LOWER CRETACEOUS SERIES

Trinity Group

Paluxy and Glen Rose equivalents.

Only two tests in western Florida on which geologic information is available have penetrated sufficiently deep to provide a comprehensive idea of the nature of the pre-Tuscaloosa formations. Magnolia Petroleum Co. #1 State in Bay County penetrated approximately 1150 feet, and Pure Oil Co. #1 Hopkins, Gulf County, some 3350 feet, below the base of the Upper Cretaceous. Both these tests are believed to have stopped in beds of Lower Cretaceous Age, probably correlating with the Trinity Group of Texas.

Lithologic character, thickness, and fossils. -- The Lower

Cretaceous section in Gulf County consists of fine argillaceous sands interbedded with red and green shales, with lesser quantities of sandy limestone nodules. Some coarse sand zones with traces of feldspar have been noted, but the sands as a whole are not very arkosic. There is no apparent sharp division between the Lower Cretaceous and Lower Tuscaloosa either on the basis of red shale or pink limestone nodules, two of the criteria frequently used in other areas. A bed of brilliant red clay about 1800 feet below the top of the Lower Cretaceous can be correlated with a similar bed in a well in Leon County, some distance to the east.

About 2500 feet below the top of the Lower Cretaceous in the Gulf County well a lithologic change is noted, consisting of the disappearance of green mottlings from the red shales. This break is accompanied by a change in the general character of the electrical self potential and resistivity logs. About 30 feet below this break traces of clear gray anhydrite and some gray limestone were observed in the cuttings. The same general type of lithology continues to the bottom of the hole.

The Lower Cretaceous in Bay County is made up of sand, finer than the overlying Lower Tuscaloosa, red and dull green extremely micaceous shale, and lesser amounts of chloritic gray shale. About 200 feet below the top of the Lower Cretaceous a zone of thin dolomite was noted containing molds of mollusks. These are the only fossil indications noted in the Lower Cretaceous in western Florida. Together with certain characteristics of the lithology, they suggest

a possible brackish or deltaic origin for some of these beds. The Bay County test apparently did not go deep enough to reach the lower section containing anhydrite noted in the Pure well.

Regional correlation of the Lower Cretaceous.

The lower 325 feet of the Pure #1 Hopkins may be tentatively correlated with the Glen Rose Formation, on the basis of the previously mentioned anhydrite and limestone and the general change in lithologic character. This correlation is of course extremely questionable, since so far as is known there are no other wells containing known Glen Rose nearer than Mississippi, 200 miles or more to the northwest. The Union Producing Co.'s deep test on the Hatchetigbee anticline contained approximately 4300 feet of undifferentiated clastic beds which has been assigned to the Trinity. This interval may contain beds equivalent to the Glen Rose, but no anhydrite was noted therein. Deep tests in Barbour County, Alabama, and in Mitchell County, Georgia, logged beds similar in some aspects to the lower part of the section in the Pure Oil Co. test, but so far as is known they contained no anhydrite. The nearest test to date in which anhydrite is definitely reported to be present in the Lower Cretaceous (excluding the non-clastic Lower Cretaceous section found in deep wells in the southern part of peninsular Florida) is Humble #1 Hurst, a deep test in Greene County, Mississippi.

The upper 2500 feet of Lower Cretaceous in the Pure test and the entire pre-Tuscaloosa section in the Magnolia test are assumed to be of Trinity age younger than Glen Rose, and hence are

tentatively and questionably assigned to the Paluxy. Similar beds have been found in a number of tests drilled in Alabama, Georgia and northeastern Florida.

POSSIBLE PRE-CRETACEOUS SERIES

The above-described beds of supposedly Lower Cretaceous age are the oldest yet penetrated in western Florida. However a number of tests in north central Florida and in nearby Alabama and Georgia are thought to have penetrated pre-Cretaceous formations, and it is probable that deeper drilling in western Florida would reach beds of similar age. Some of the series, groups and formations which might reasonably be expected to underlie the Cretaceous in western Florida are as follows:

JURASSIC SERIES

Cotton Valley Group, Buckner, Smackover and Eagle Mills Formations (?)

The equivalents of all these formations are thought to have been penetrated by a 12,400-foot test drilled in 1941 on the Hatchetigbee Anticline in Clarke County, Alabama, by the Union Producing Company. In this test the Cotton Valley was represented by a "red bed facies" 2220 feet thick, composed of coarse non-marine sands, varicolored clays, and hard sandy limestone, underlain by 604 feet of red and green clay and fine-grained red sandstone; the Buckner by 126 feet of beds similar to the above, but interbedded with thin beds of anhydrite and limestone; the Smackover by 460 feet of fossiliferous gray limestone and anhydrite; and the Eagle Mills by 137 feet

of sandstone, limestone and anhydrite underlain by 32 feet of rock salt.

Further east in Alabama, Humble #1 Skinner, an 11,100-foot dry hole drilled in 1944 in Escambia County, Alabama, penetrated upwards of 800 feet of non-marine sands which have been tentatively assigned to the Cotton Valley, underlying some 4800 feet of clastic beds of probable Trinity age. A deep test in Mitchell County, Georgia, logged around 900 feet of possible Cotton Valley beds.

Still more recently, a deep test drilled by the Southern Natural Gas Co. in Wilcox County, Alabama, is reported to have encountered approximately 525 feet of unmetamorphosed limestone and dark shale which is tentatively assigned to the Smackover, underlain by 445 feet of pink and gray calcareous sand which may be equivalent to the Eagle Mills, followed by 36 feet of red sand and at least 94 feet of solid rock salt which appears to be typical Eagle Mills.

The presence of these formations in the latter test suggests that, if they are present so far updip as Wilcox County, Alabama, there is a good chance that they may also underlie at least a portion of southeastern Alabama and western Florida.

TRIASSIC SERIES

Newark Group

At least two tests located some distance updip from western Florida have penetrated beds of possible Triassic age. These are Stebinger #1 Robinson, Barbour County, Alabama, which cored very hard brick-red shale and coarse arkosic sands, with basic intrusives in

in the upper part, from approximately 4,050 feet to T.D. 4,950; and Stanolind #1 Pullen, Mitchell County, Georgia, which logged similar material from 6,230 to 7,475 feet. Hinton #1 Creel, Barbour County, Alabama, also probably contained a similar section from about 4,375 feet to bottom, although the samples are very poor.

The material in these tests bears a strong resemblance to the Newark group of the Atlantic Coastal Plain, which outcrops as far south as North Carolina, and which is reported to have been penetrated by wells in South Carolina. The Triassic formations along the east coast occur in long deep and relatively narrow blocks which have been downfaulted into the crystalline basement. The same conditions may exist in portions of southwestern Georgia and southeastern Alabama, and even in western Florida.

PALEOZOIC AND PRE-PALEOZOIC SYSTEMS

The basement complex of western Florida probably consists of Paleozoic sediments and possibly still older metamorphic and igneous rocks. A well drilled in 1943 in Early County, Georgia, cored dark shale of probable Paleozoic age at around 7000 feet; and several tests in northeastern Florida and southern Georgia are reported to have encountered Paleozoic sediments at even shallower depths. Other tests in Georgia have stopped in metamorphic and igneous rocks of unknown age. Two recent tests far undrilled in Bullock County, Alabama, reached granitic rocks at comparatively shallow depths. Basement could probably be reached by the drill in the northeastern portion of western Florida area, but it is very doubtful whether a well could be drilled deep enough to reach basement at the southwestern edge of the state.

PART IV. LIST OF OUTCROPS IN FLORIDA WEST OF THE APALACHICOLA RIVER

BAY COUNTY

MIOCENE ALUM BLUFF

SE/4 Sec. 21-2N-12W 1 mi. below Scotts bridge, exposed 9.9'.

MIOCENE ALUM BLUFF

NE/4 Sec. 28-2N-12W 1-3/4 mi. below Scotts bridge, exposed
6' fossiliferous sd.

MIOCENE ALUM BLUFF - CHIPOLA

Sec. 4-1S-13W R. L. Gainer's Farm, Econfina Creek, about 1
mi. below a bridge.

MIOCENE DUPLIN

Sec. 4-1S-13W R. L. Gainer's Farm, Econfina Creek, about 1
mi. below a bridge, also exposed along road from Econfina to
bridge over Econfina Creek.

CALHOUN COUNTY

MIOCENE TAMPA LS.

SW cor. Sec. 32-2N-9W Stop No. 5 of this field trip.

MIOCENE TAMPA LS.

S/2 Sec. 29-2N-9W Sinks E. of Willis bridge over Chipola River,
3.8 mi. W. of Altha.

MIOCENE ALUM BLUFF - CHIPOLA

SW/4 SW/4 Sec. 8-1N-9W On W. bank Chipola River, on J. M. P.
McClelland farm 2 1/4 mi. E. of Carr. Type locality of Chipola
formation.

MIOCENE ALUM BLUFF - CHIPOLA

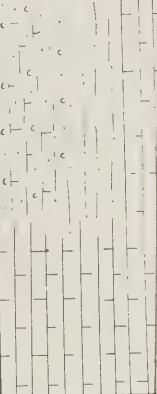
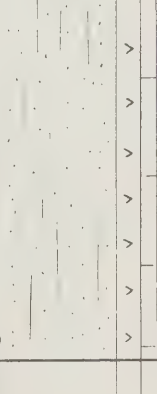
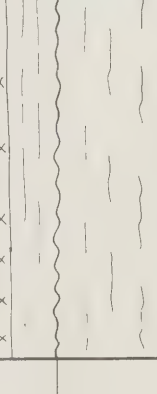
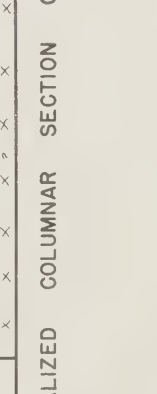
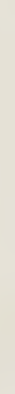
W/2 Sec. 12-1N-10W Stop No. 4 of this field trip.

MIOCENE ALUM BLUFF - CHIPOLA

NW/4 Sec. 17-1N-9W Mouth of Senterfeit Creek on Chipola
River, 1/2 mi. below type locality for Chipola.

MIOCENE DUPLIN

W/2 Sec. 7?-1S-9W Darling's slide on left bank of Chipola
River, 1 mi. or more N. of Abe's Spring, about 2 1/2 mi. SE
of Clarksville.

SERIES	GROUP	FORMATION	COLUMNAR SECTION	THICK- NESS	CHARACTER
PEIST.		NON-MARINE(?) TERRACES		0-120'	Sand, gravel, and mottled red and gray sandy clay, coarse material at base of each of the several terraces. No marine fossils.
Pliocene	TAYLOR	unconformity			
		BEDS OF TAYLOR AGE (equivalent to upper part of the Selma chalk in Alabama.)		350-680' (thin sharply to east, apparently truncated by truncation)	Planulina raynoldsii Strepasoma americana Buliminoides decorata Cyclonina mitchelliana
					In west, consists mainly of gray, hard, heavy and chalky limestone. In east, consists of fine to coarse glauconitic, porous sand with green to gray siliceous sand; dominantly of light gray sand with some dark or marl. The dark sand is commonly in thin layers but apparently is not consistently bedded. The dark sand is a fairly brownish gray, white speckled sand is usually present.
		BEDS OF AUSTIN AGE		350-450'	Microdonia Pachydictya Pachydictya constricta Pachydictya constricta Pachydictya constricta
LO	JURASSIC(?)	GLEN ROSE EQUIVALENT (?)		828±	with limestone nodules, nodules of this kind together with a layer change to thin, suggests possible correlation with the Glen Rose formation of Louisiana and Arkansas.
		unconformity ?		?	Two beds in Clarke and Escambia Counties, Alabama, which have been identified as Glen Rose. These beds may also be present in Western Florida, but to date no beds in this area have encountered any rocks closely resembling them.
		BUCKNER (?)		?	A recent test in Wilcox County, Alabama, encountered more than 500 feet of dark limestone and shale which is suggestive of Shackover.
		SMACKOVER (?)		?	Massive dark red shales interbedded with coarse grained sandstone and dolomite, similar to the Newark Series of the Atlantic Coast. Have been tentatively identified as Glen Rose in Wilcox County, Alabama, and Mitchell County, Georgia. They may also be present under various of Western Florida, possibly as segments contributed into the crystalline basement.
		EAGLE MILLS (?) unconformity		?	Black shale and hard sandstone of probably Paleozoic age was penetrated in a deep test in Early County, Georgia, and in all tests further east in Georgia and North Florida. They probably represent Mesozoic rocks of paleozoic age and are not those of other rocks in Georgia. It is probable that one or all of these types of rock underlie the post-Mesozoic sediments in Western Florida.
PALEOZOIC TRIASSIC(?)	NEWARK(?)	UNDIFFERENTIATED		?	
		unconformity		?	
PALEOZOIC TRIASSIC(?)		UNDIFFERENTIATED PALEOZOIC SEDIMENTS, AND		?	
		IGNEOUS AND METAMORPHIC ROCKS.		?	

SERIES	GROUP	FORMATION	COLUMNAR SECTION	THICK- NESS	CHARACTER
PLEISTOCENE		NON-MARINE (?) TERRACES		0-120'	Sand, gravel, and mollusk shell and gray sandy clay, coarse material of beach, much of the material terraced.
Eocene	Vicksburg	unconformity		0-30'	Unconformity between lower and upper part of the Vicksburg formation.
		DUPLIN MARL		0-100'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		unconformity		60-200'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		SHOAL RIVER FORMATION		50-250'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
Eocene	JACKSON	CHIPOLA FORMATION		100-200'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		TAMPA LIMESTONE		100-200'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		unconformity		100±	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		CHICKASAWHAY-BYRAM-GLENDON		100±	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
Eocene	CLAIBORNE	MARIANNA LIMESTONE		50±	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		unconformity		150±	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		ODALA LIMESTONE		50±	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		WOODY'S MARL		50±	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
Eocene	WILCOX	LISBON FORMATION		300-425'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		unconformity		155-500'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		TALLAHATTA FORMATION		155-500'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		unconformity		381-1700'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
Paleocene	MIDWAY	UNDIFFERENTIATED WILCOX		381-1700'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		SALT MOUNTAIN LIMESTONE		70-340'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		UNDIFFERENTIATED MIDWAY		260-780'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		unconformity		0-130' (?)	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
Upper Cretaceous	TAYLOR	BEDS OF NAVARRO AGE (?)		0-130' (?)	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		BEDS OF TAYLOR AGE		350-680'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		BEDS OF AUSTIN AGE		350-450'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		UPPER TUSCALOOSA - EAGLEFORD		400-510'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
Lower Cretaceous	TUSCALOOSA	MIDDLE ("MARINE") TUSCALOOSA		245-375'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		LOWER TUSCALOOSA		425-745'	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		PALUXY EQUIVALENT (?)		2500±	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		GLEN ROSE EQUIVALENT (?)		828±	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
Jurassic	COTTON VALLEY (?)	UNDIFFERENTIATED		?	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		BUCKNER (?)		?	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		SMACKOVER (?)		?	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		EAGLE MILLS (?)		?	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
Triassic	NEWARK (?)	UNDIFFERENTIATED		?	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		UNDIFFERENTIATED PALEOZOIC SEDIMENTS, AND IGNEOUS AND METAMORPHIC ROCKS		?	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		UNDIFFERENTIATED		?	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.
		UNDIFFERENTIATED		?	Thin bedded, gray, sandy clay, coarse material of beach, much of the material terraced.

GENERALIZED COLUMNAR SECTION OF WEST FLORIDA

MIOCENE DUPLIN

S. line Sec. 17-1S-9W Left bank of Chipola River, 200' N. of Abe's Spring, about $3\frac{1}{2}$ mi. SE of Clarksville. 7' marl, 19' clay.

MIOCENE DUPLIN

NE/4 Sec. 36-1N-10W Dripping Springs on Four Mile Creek.
Stop No. 3 of this field trip.

FRANKLIN COUNTY

MIOCENE DUPLIN

Shallow pit on S. side of Rock Creek, about $\frac{1}{2}$ mi. S. of Knox Still Landing on New River, about 15 mi. by water from Carrabelle.

HOLMES COUNTY

EOCENE SS. & LS. "OCALA"

NW/4 Sec. 3-6N-16W 5.5' exposed along Choctawhatchee River, $2\frac{1}{4}$ mi. S. of Ala. line.

EOCENE OCALA LS.

Sec. 33-5N-16W Silicified limestone, along Choctawhatchee River, $3\frac{1}{4}$ mi. S. of mouth of Wrights Creek.

EOCENE OCALA LS.

SW/4 SW/4 NE/4 Sec. 35-7N-16W Silicified limestone.

EOCENE OCALA LS.

NW/4 SE/4 Sec. 32-6N-14W. Accessible by boat, via Wrights Creek.

EOCENE OCALA LS.

SW/4 SW/4 Sec. 32-6N-14W. Accessible by boat, via Wrights Creek.

EOCENE OCALA LS.

NW/4 NE/4 Sec. 6-5N-14W Accessible by boat, via Wrights Creek.

EOCENE OCALA LS.

NE/4 SW/4 Sec. 1-5N-15W Accessible by boat, via Wrights Creek.

EOCENE OCALA LS.

NW/4 SE/4 Sec. 13-5N-16W Accessible by boat, via Wrights Creek.

EOCENE OCALA LS.

NW/4 NW/4 Sec. 26-5N-16W Accessible by boat, via Wrights Creek.

EOCENE OCALA LS.

SE/4 NE/4 Sec. 1-5N-15W Accessible by boat, via Wrights Creek.

EOCENE OCALA LS.

SE/4 NE/4 Sec. 3-5N-15W Accessible by boat, via Wrights Creek.

EOCENE OCALA LS.

NW/4 NW/4 Sec. 35-5N-16W Accessible by boat, via Wrights Creek.

EOCENE OCALA ? LS.

Sec. 12-5N-17W "Blue Spring" W. of Choctawhatchee River,
outcrops below water level. Ls. with large curved orbitoids.

OLIGOCENE MARIANNA LS.

NW/4 SE/4 Sec. 26-5N-16W 4' sandy fossiliferous ls. Little
Gum Creek, 1/4 mi. W. of Hathaway Mill. (Amusium ocalanum
present, so possibly Ocala according to Cooke 1945). Probably
Lep. fragilis zone.

OLIGOCENE MARIANNA LS.

NW/4 SE/4 Sec. 3-5N-17W Small sink, 36' fossiliferous, sandy.
Cooke doubts Marianna age (1945).

OLIGOCENE BYRAM

SE/4 Sec. 3-4N-17W Sinkhole.

OLIGOCENE SUWANNEE LS.

SW/4 NW/4 Sec. 15-5N-17W Small sink, exposed 8', large fauna.

OLIGOCENE MARIANNA OR BYRAM

NE/4 NW/4 SE/4 Sec. 26-5N-18W 1 mi. E. of Walton Co. line,
1/2 mi. SE. of Leonia on N. C. Spears farm. Marianna according
to Vernon 1942, possibly Byram according to Cooke 1945.

MIOCENE TAMPA LS.

SW cor. NE/4 Sec. 29-5N-17W Cut on road 88, silt & clay.

MIOCENE TAMPA LS.

NW cor. SW/4 Sec. 16-5N-17W Cut exposing 16' clay & silt, on
road 88. Best Tampa exposure in Holmes County.

MIOCENE TAMPA LS.

NE/4 SW/4 Sec. 8-5N-17W Road cut, clay & silt.

MIOCENE TAMPA LS.

SW/4 Sec. 8-5N-17W Road cut, clay & silt.

MIOCENE TAMPA LS.

NW/4 Sec. 14-5N-17W Along hill W. of road, clay & silt.

JACKSON COUNTY.

EOCENE OCALA LS.

SE/4 Sec. 32-6N-11W Stop No. 8 of this field trip.

EOCENE OCALA LS.

Sec. 20-5N-11W Carters Mill Creek Sink, $3\frac{1}{2}$ mi. N-NW of Marianna, 27' ls.; may include some Oligocene.

OLIGOCENE MARIANNA LS.

Quarry on N. bank of Blue Springs Creek, 4 mi. E. of Marianna, 30' exposed, possibly partly Byram.

OLIGOCENE MARIANNA LS.

Pabbs Valley, $3\frac{1}{2}$ mi. SE of Cottondale. Small exposure.

OLIGOCENE MARIANNA LS.

SW cor. SE/4 SE/4 Sec. 35-5N-10W Quarry on E. side of Marianna. Greenwood road, $1\frac{1}{2}$ mi. NE of junction of this road with Fla. State Road 1.

OLIGOCENE MARIANNA LS.

SE/4 SE/4 Sec. 3-4N-10W Roof & wall of a cave exposed in road cut on Fla. State Road No. 1, about 150 yds. E. of bridge over Chipola River just E. of Marianna.

OLIGOCENE MARIANNA LS.

Sec. 31 or 32-5N-11W Quarry of C. Welsh, $1\frac{1}{2}$ mi. E. of Cottondale, on L. & N. Railroad. 10-12' exposed.

OLIGOCENE MARIANNA LS.

M. R. Burton's pit, $2\frac{1}{2}$ mi. NE of Marianna, 20' ls.

OLIGOCENE MARIANNA LS.

Quarry on M. A. Spate's land, $1\frac{1}{2}$ mi. N. of Cottondale. 8' exposed.

OLIGOCENE MARIANNA LS.

Approx. NW/4 NE/4 Sec. 10-4N-10W Quarry on W. bank of Chipola River at the Louisville & Nashville railroad bridge below Marianna. 31' exposed.

OLIGOCENE MARIANNA LS.

SE/4 Sec. 29-5N-10W Penn Street in Marianna. 35' of "chimney rock".

OLIGOCENE MARIANNA LS.

E/2 Sec. 13-6N-12W Quarry E. of U. S. Highway 231, 2 mi. S-SE of Campbelltown. Contact with Ocala.

OLIGOCENE MARIANNA LS.

NE/4 Sec. 34-5N-10W Stop No. 9 of this field trip.

OLIGOCENE MARIANNA LS.

Sec. 21-5N-11W Along Springfield road. Contact with Ocala in SW/4 Sec. 20.

OLIGOCENE MARIANNA LS.

SE/4 Sec. 3-4N-10W Type locality. Stop No. 6 of this field trip.

OLIGOCENE BYRAM

On second hill W. of Chipola River along the street in Marianna leading to the old bridge.

OLIGOCENE SUWANNEE LS.

Sec. 6-2N-9W NW. of Altha (Calhoun Co.) at a wide curving shoal of Chipola River.

OLIGOCENE BYRAM

SE/4 Sec. 3-4N-10W Stop No. 9 of this field trip.

OLIGOCENE BYRAM

Sec. 11-3N-10W Bridge over Dry Creek, 7 mi. S. of Marianna.

OLIGOCENE BYRAM

SW/4 Sec. 30-5N-10W. Stop No. 7 of this field trip.

MIOCENE TAMPA LS.

Approx. S/2 Sec. 9-3N-7W Blountstown road, 2.7 mi. S. of Sneads.

MIOCENE TAMPA LS.

S/2 Sec. 26-4N-7W 1/4 mi. N. of highway & 1 1/2 mi. E. of Sneads.

MIOCENE TAMPA LS.

Sec. 28-4N-7W 1/2 mi. N. of highway & 1/2 mi. W. of Sneads.

MIOCENE TAMPA LS.

Sec. 30-4N-7W Falling Branch, a double sink about 50' deep.
Exposed 30' ls.

OLIGOCENE MARIANNA LS.

Philip Sexton's pit, 1-3/4 mi. NE of Marianna. 15' ls.

OKALOOSA COUNTY

MIOCENE ALUM BLUFF - CHIPOLA?

Secs. 23 & 24, 5N-22W Road cuts.

MIOCENE ALUM BLUFF - CHIPOLA?

Sec. 11-4N-22W Road cuts.

MIOCENE ALUM BLUFF - CHIPOLA?

Secs. 23 & 35-5N-22W Cuts on State Highway 234.

MIOCENE ALUM BLUFF - SHOAL RIVER

Secs. 2 & 3, 3N-22W Shoal River at Dorcas. 7' exposed.

MIOCENE ALUM BLUFF - SHOAL RIVER

SW/4 Sec. 13-3N-23W E. side Shoal River, 600' above U. S. Highway 90, 4 mi. E. of Crestview.

MIOCENE ALUM BLUFF - SHOAL RIVER

SE/4 Sec. 36-5N-24W On Highway 165.

MIOCENE ALUM BLUFF - SHOAL RIVER

NE/4 Sec. 30-5N-23W Creek crossing State Highway 165, 2 mi. SW of Oak Grove.

MIOCENE ALUM BLUFF - SHOAL RIVER

Sec. 15-5N-23W Tanner's Mill, 4-3/4 mi. SE of Laurel Hill.

MIOCENE ALUM BLUFF - SHOAL RIVER

Sec. 16 or 17, 5N-23W Type locality for Oak Grove sand member of Shoal River formation, bed & bank of Yellow River 400' below bridge at Oak Grove.

MIOCENE ALUM BLUFF - SHOAL RIVER

SW/4 SW/4 Sec. 35-4N-22W In ditch along State Highway 234, N. of bridge at Dorcas.

MIOCENE ALUM BLUFF - SHOAL RIVER

About N/2 of W. line Sec. 10-3N-24W Between Yellow River and Highway 165, 2.4 mi. N. of Milligan.

MIOCENE ALUM BLUFF - CHIPOLA?

SE/c Sec. 17-5N-22W Road cut.

WALTON COUNTY

OLIGOCENE BYRAM

Approx. Sec. 26-7N-20W Just S. of Ala.-Fla. line, ab. 7 mi. E. of Florala Ala. "Natural Bridge".

MIOCENE ALUM BLUFF - CHIPOLA

Probably Sec. 22-2N-18W Folks Creek on Armstrong Farm.

MIOCENE ALUM BLUFF - CHIPOLA

N/2 Sec. 2-1N-18W Bruce Creek near Old Walton Bridge, $9\frac{1}{2}$ mi.
SE. of DeFuniak Springs. Mollusks described by Julia Gardner.

MIOCENE ALUM BLUFF - CHIPOLA?

Sec. 31-5N-20W Cuts on State Highway 40.

MIOCENE ALUM BLUFF - SHOAL RIVER

Sec. 17-1N-19W Old road cut on E. bank of Alaqua Creek, on P.
Permenter's farm. "Permenter farm" beds of Hendee Smith,
40' exposed.

MIOCENE ALUM BLUFF - SHOAL RIVER

SW/4 Sec. 10-2N-17W Stop No. 13 of this field trip.

MIOCENE ALUM BLUFF - SHOAL RIVER

SW/4 Sec. 23-2N-18W Stop No. 14 of this field trip.

MIOCENE ALUM BLUFF - SHOAL RIVER

Sec. 22-2N-18W Folks Creek, $1\frac{1}{4}$ mi. back of J. M. Armstrong's
house, 1 mi. W. of Whites Creek bridge locality.

MIOCENE ALUM BLUFF - SHOAL RIVER

NW/4 Sec. 26-4N-20W State Highway 40 crossing over Big Swamp
Creek, near Liberty, 6.6 mi. N. of Bearhead.

MIOCENE ALUM BLUFF - SHOAL RIVER

NW/4 Sec. 11-3N-21W At mill on Adams Mill Creek, $2\frac{3}{4}$ mi. N.
of Mossy Head.

MIOCENE ALUM BLUFF - SHOAL RIVER

SW/4 Sec. 19-2N-18W Bruce Creek - Small falls, 5' marl exposed.

MIOCENE ALUM BLUFF - SHOAL RIVER?

SW/4 SE/4 Sec. 8-2N-19W Mill race just below Sconiers Mill on
Sconiers Mill Creek.

MIOCENE ALUM BLUFF - SHOAL RIVER

Sec. 9-2N-19W On old Langley Farm at a dripping spring on
bluff above Sconiers Mill Creek.

MIOCENE ALUM BLUFF - SHOAL RIVER

SW/4 Sec. 28-2N-19W From old mill to $1\frac{1}{2}$ mi. down stream, on
Vaughan or Blounts Creek.

MIOCENE ALUM BLUFF - SHOAL RIVER

Sec. 27-2N-19W Arca zone, exposed 100' below small falls near
head of Vaughan or Blounts Creek, 6' fossiliferous marl.

MIOCENE ALUM BLUFF - SHOAL RIVER

NE cor. SE/4 Sec. 8-1N-19W Alice Creek, a tributary of
Alaqua Creek.

MIOCENE ALUM BLUFF - SHOAL RIVER

About Sec. 14 or 15-2N-17W W. bank of Choctawhatchee River,
1 mi. SE of Red Bay - John Anderson's farm. Type locality
for old Choctawhatchee formation and the Arca zone.

MIOCENE ALUM BLUFF - SHOAL RIVER

NE/4 NE/4 Sec. 17-2N-19W Stop No. 15 of this field trip.

MIOCENE ALUM BLUFF - SHOAL RIVER

Sec. 18-2N-19W Stop No. 16 of this field trip.

MIOCENE ALUM BLUFF - SHOAL RIVER

NE/4 Sec. 29-2N-19W 3/4 mi. off Steele Church road, on Bell's
Farm. Exposed in small branches flowing into Sconier's Mill
Creek; 10-15' marl.

MIOCENE ALUM BLUFF - SHOAL RIVER

NW/4 Sec. 3-3N-21W Stop No. 17 of this field trip.

WASHINGTON COUNTY

OLIGOCENE BYRAM

SE/4 Sec. 36-4N-14W Stop 11 of this field trip.

OLIGOCENE SUWANNEE LS.

NW/4 NW/4 Sec. 27-4N-13W Stop No. 10 of this field trip.

OLIGOCENE SUWANNEE LS.

NW/4 Sec. 36-4N-13W Small sink on Gilbert Farm. 48.4' exposed.

OLIGOCENE SUWANNEE LS. & POSS. SOME MARIANNA

N/2 SW/4 Sec. 36-4N-14W Test pit & old road bed. Exposed 55'.

OLIGOCENE SUWANNEE LS. PROB. BYRAM ACC. TO MACNEIL

SW/4 SE/4 Sec. 33-3N-13W A. L. Parish farm, lime sink,
20.9' exposed.

OLIGOCENE SUWANNEE LS.

NE/4 NW/4 Sec. 33-4N-13W Sink on T. A. Finch Farm. Exposed
25' very fossiliferous ls; forams and bryozoa.

OLIGOCENE SUWANNEE LS.

NE/4 NE/4 Sec. 14-4N-13W Small sink exposing 13' foram coquina.

- OLIGOCENE SUWANNEE LS.
NW/4 NW/4 Sec. 1-3N-14W Old quarry, exposed 12'.
- OLIGOCENE SUWANNEE LS.
SE/4 NE/4 Sec. 16-4N-13W Road cut, 18' exposed.
- OLIGOCENE SUWANNEE LS.
NW/4 SE/4 Sec. 16-4N-13W Small sink exposing 20'.
- OLIGOCENE SUWANNEE LS.
NE/4 SE/4 SE/4 Sec. 16-4N-16W Abandoned quarry, exposing 15'.
- OLIGOCENE SUWANNEE LS.
NE/4 NE/4 Sec. 32-4N-13W Small sink exposing 50'.
- OLIGOCENE SUWANNEE LS.
S/4 of line of secs. 14 & 15-4N-13W Road cut, 3' exposed.
- OLIGOCENE SUWANNEE LS.
SW/4 SW/4 SW/4 Sec. 36-4N-14W Road cut exposing 18'.
- OLIGOCENE SUWANNEE LS.
NE/4 Sec. 14-4N-13W Abandoned lime kiln, Alford Lbr. Company.
- OLIGOCENE SUWANNEE LS.
NE/4 Sec. 15-4N-13W Laney Farm.
- MIOCENE TAMPA LS.
NW/4 NW/4 Sec. 27-4N-13W Stop No. 10 on this field trip.
- MIOCENE TAMPA LS.
Sec. 27-4N-13W 11' silty marl.
- MIOCENE TAMPA LS.
W/2 Sec. 16-5N-17W 16' silt & clay along Road 88.
- MIOCENE TAMPA LS.
Center Sec. 3-2N-16W 2' sandy ls. on bank of Holmes Creek.
- MIOCENE TAMPA LS.
SW/c NE/4 Sec. 17-3N-16W Road bed, 4' of fossiliferous clay exposed.
- MIOCENE TAMPA LS.
NE/c NW/4 NE/4 Sec. 17-3N-16W On Choctawhatchee River escarpment, 10' ls. & argillaceous ls.

MIOCENE TAMPA LS.

SE/4 SE/4 Sec. 8-3N-16W Old quarry on Choctawhatchee River escarpment, 15.4' of fossiliferous ls.

MIOCENE ALUM BLUFF

SE/4 Sec. 33-1N-13W 1 mi. N. of Gainers bridge, along Econfina Creek; 5' coquina sand.

MIOCENE ALUM BLUFF - CHIPOLA

SW/4 Sec. 27-1N-13W About 1 mi. above Gainers bridge, on Econfina Creek, 4' coquina sand.

MIOCENE ALUM BLUFF

NE/4 Sec. 22-1N-13W 1/4 mi. below Walsingham bridge on Econfina Creek; 23.2' exposed.

MIOCENE ALUM BLUFF

Center N/2 SE/4 Sec. 21-4N-13W Along road, 9.7' argillaceous silt & clay; just to S. 20' of same.

MIOCENE ALUM BLUFF

Center Sec. 24-4N-13W "Rock Hill"; 15.4' sd. & silt with clay pebbles, indurated; total section 41.2'.

MIOCENE ALUM BLUFF

NE/4 Sec. 2-3N-13W "Orange Hill"; greenish gray silt.

MIOCENE ALUM BLUFF

SW/4 Sec. 27-3N-14W Ravine N. of road. 23.9' Alum Bluff silt, sd. & clay. Few poor fossils.

MIOCENE ALUM BLUFF

SW/4 Sec. 26-3N-14W On Wausau-Vernon Road, 6.5 mi. E. of Vernon; green silt.

MIOCENE ALUM BLUFF - SHOAL RIVER

SE/4 Sec. 27-3N-14W 5.4 mi. E. of Vernon, 6' sand with mollusk molds.

MIOCENE ALUM BLUFF - SHOAL RIVER

SW/4 SE/4 Sec. 28-3N-14W 3.9 mi. E. of Vernon, 25-35' sand & clay. Mollusk molds.

MIOCENE ALUM BLUFF - SHOAL RIVER

SW/4 NE/4 Sec. 7-2N-15W Road cut on Highway 39, 13.6'

MIOCENE ALUM BLUFF - SHOAL RIVER

SE/4 SW/4 Sec. 12-2N-16W Cut on Road 39, 10.3'.

MIOCENE ALUM BLUFF - SHOAL RIVER

NE/4 NE/4 Sec. 14-2N-16W State Road 39, 25' weathered sd.
& gravel.

MIOCENE ALUM BLUFF - CHIPOLA

NE/4 Sec. 28-2N-16W On Holmes Creek, 200 yds. up a small
ravine; 61' section, including 20.8' of Chipola.

MIOCENE ALUM BLUFF

NE/4 Sec. 28-2N-16W 22' above Holmes Creek, dense ls. with
abundant mollusks.

MIOCENE ALUM BLUFF

NE/4 Sec. 28-2N-16W 12' above Holmes Creek, 10' dense
fossiliferous ls.

MIOCENE ALUM BLUFF - CHIPOLA

SW/4 Sec. 28-2N-16W On Holmes Creek, 12.2'.

MIOCENE ALUM BLUFF - CHIPOLA

SW/4 Sec. 28-2N-16W Dick Petersons Woodyard Landing on
Holmes Creek.

MIOCENE ALUM BLUFF - CHIPOLA

SE/4 SE/4 Sec. 5-1N-16W E. bank of Holmes Creek. Stop No. 12
on this field trip.

MIOCENE DUPLIN

Sec. 77-1N-13W, Hamlin Pond. About 5 mi. E. of Greenhead.
Ecphora Zone.

BIBLIOGRAPHY

1. Aldrich, T. H.
1903 A new *Conus* from the Tertiary of Florida.
Nautilus, Vol. XVI, pp. 131-132. (Describes *C. waltonensis* from the Shoal Creek, Walton Co., Fla.)
2. 1910 A new fossil *Mitra* from West Florida and a new Eocene *Astarte*.
Nautilus, Vol. XXIII. No. 10, pp. 121-122, 1 pl.
3. Applin, P. L. and Applin, E. R.
1944 Regional subsurface stratigraphy and structure of Florida and Southern Georgia. *Am. Assoc. Petroleum Geologists Bull.* Vol. 28, No. 12, pp. 1673-1753.
4. Applin, E. R. and Jordan, Louise.
1945 Diagnostic foraminifera from subsurface formations in Florida.
Jour. Paleontology, Vol. 19, No. 2, pp. 129-148, pls. 18-21.
5. Bell, O. G.
1924 A preliminary report on the clays of Florida (exclusive of fuller's earth). *Florida State Geol. Survey 15th Ann. Rept.*, 1922-1923, pp. 53-260.
6. Berry, E. W.
1916 The flora of the Citronelle formation. *U. S. Geol. Survey Prof. Paper 98-L*, pp. 193-208.
7. 1916 The physical conditions and age as indicated by the flora of the Alum Bluff formation. *U. S. Geol. Survey Prof. Paper 90-E*, pp. 41-59.
8. Brantley, T. E.
1924 Resume of the geology of the Gulf Coastal Plain. *Am. Assoc. Petroleum Geologists Bull.*, Vol. 8, pp. 21-28.
9. Burnett, W. I.
1854 (Elevations in Florida.) *Am. Jour. Sci.*, (2), Vol. XVII, p. 407.
(Letter to Professor J. D. Dana.)
10. Burns, Frank
1889- Field notes on the Miocene of West Florida.
1890 (Unpublished,) in files of U. S. Geol. Survey.
11. 1895 Field notes on eastern Mississippi and West Florida.
(Unpublished). In files of U. S. Geol. Survey.
12. Blanchard, W. G.
1938 What are Florida's chances (for oil)? *Oil Weekly*. Vol. 89, No. 5, pp. 60-63, 3 figs. incl. index and relief maps.

13. Canu, Ferdinand and Bassler, R. S.
1920 North American early Tertiary Bryozoa. U. S. Nat. Mus. Bull. 106, 879 pp., 279 figs., 162 pls.
14. 1923 North American later Tertiary and Quaternary Bryozoa. U. S. Nat. Mus. Bull. 125, 302 pp., 38 figs., 47 pls.
15. Casey, T. L.
1901 On the probable age of the Alabama White Limestone. Acad. Nat. Sci. Philadelphia, Proc. pp. 513-518.
16. Clapp, F. G.
1908 The Grand Gulf and Lafayette formations in northern Florida. Abstract: Science, new ser., Vol. 27, p. 993.
17. Clark, W. B.
1891 Correlation papers: Eocene. U. S. Geol. Survey Bull. 83. (Eocene of Florida discussed on pp. 55-57, & 82-83.)
18. Cole, W. S., and Ponton, G. M.
1930 The foraminifera of the Marianna limestone of Florida. Florida Geol. Survey Bull. 5, pp. 19-69, pls. 5-11.
19. Cole, W. S.
1934 Oligocene orbitoids from near Duncan Church, Washington County, Florida. Jour. Paleontology, Vol. 8, No. 1, pp. 21-28, 2 pls.
20. 1938 Stratigraphy and paleontology of two deep wells in Florida. Florida Geol. Survey Bull. 16, 73 pp., 12 pls.
21. Cooke, C. W.
1915 The age of the Ocala limestone. U. S. Geol. Survey Prof. Paper 95-I, pp. 107-117.
22. 1917 The stratigraphic position and faunal associates of the orbitoid foraminifera of the genus *Orthophragmina* from Georgia and Florida. U. S. Geol. Survey Prof. Paper 108-G, pp. 109-113.
23. 1918 Correlation of the deposits of Jackson and Vicksburg ages in Mississippi and Alabama. Washington Acad. Sci. Jour., Vol. 8, pp. 186-198.
24. 1922 The Byram calcareous marl of Mississippi. U. S. Geol. Survey Prof. Paper 129-E, pp. 79-85.
25. 1923 The correlation of the Vicksburg group. U. S. Geol. Survey Prof. Paper 133, pp. 1-9.
26. 1926 Geology of Alabama: the Cenozoic formations. Alabama Geol. Survey, Spec. Rept. 14, pp. 251-297, 5 pls.

27. 1926 Correlation of the basal Cretaceous beds of the southeastern States. U. S. Geol. Survey Prof. Paper 140, pp. 137-139.
28. Cooke, C. W. and Mosson, Stuart.
1929 Geology of Florida. Florida. Geol. Survey 20th Ann. Rept. pp. 29-227, 29 pls., incl. geol. map.
29. Cooke, C. W.
1930 Pleistocene seashores. Washington Acad. Sci. Jour., Vol. 20, No. 16, pp. 389-395.
30. 1930 Correlation of Coastal Terraces. Jour Geology, Vol. 38, No. 7, pp. 577-589.
31. 1931 Seven coastal terraces in the southeastern States. Washington Acad. Sci., Jour., Vol. 21, No. 21, pp. 503-513.
32. 1932 Tentative correlation of American glacial chronology with the marine time scale. Washington Acad. Sci. Jour., Vol. 22, No. 11, pp. 310-312.
33. 1935 Tentative ages of Pleistocene shore lines. Washington Acad. Sci. Jour. Vol. 25, No. 7, pp. 331-333.
34. 1935 Notes on the Vicksburg group. Am. Assoc. Petroleum Geologists Bull. Vol. 19, No. 8, pp. 1162-1172.
35. Cooke, C. W. and Mansfield, W. C.
1936 Suwannee limestone of Florida (abstract): Geol. Soc. America Proc. for 1935, pp. 71-72.
36. Cooke, C. W.
1939 Boundary between Oligocene and Miocene. Am. Assoc. Petroleum Geologists Bull., Vol. 23, No. 10, pp. 1560-1561.
37. 1939 Scenery of Florida interpreted by a geologist. Florida Geol. Survey Bull. 17, 118 pp., 53 figs.
38. 1941 Cenozoic regular echinoids of eastern United States. Jour. Paleontology, Vol. 15, No. 1, pp. 1-20, 4 pls.
39. 1942 Cenozoic irregular echinoids of eastern United States. Jour. Paleontology, Vol. 16, No. 1, pp. 1-62, 8 pls.
40. Cooke, C. W. and Gardner, Julia, and Woodring, W. P.
1943 Correlation of the Cenozoic formations of the Atlantic and Gulf Coastal Plain and the Caribbean region. Geol. Soc. America Bull., Vol. 54, pp. 1713-1723.

41. Cooke, C. W.
1945 Geology of Florida. Florida Geol. Survey Bull. 29,
314 pp., 45 figs., geol. map.
42. Cowles, H. C.
1905 A remarkable colony of northern plants along the Apalachicola
River, Florida, and its significance. Rept. 8th International
Geographic Congress (held in the U. S. in 1904), 599, (1-2p).
(Suggests that the Torreya and other plants failed to follow
the retreat of the Pleistocene ice.)
43. Cushman, J. A.
1918 Some Pliocene and Miocene foraminifera of the Coastal Plain of
the United States. U. S. Geol. Survey Bull. 676, 100 pp., 31 pls.
44. 1919 The age of the underlying rocks of Florida as shown by the
foraminifera of well borings. Florida Geol. Survey Ann. Rept..
12, pp. 77-103.
45. 1920 The American species of Orthophragmina and Lepidocyclina.
U. S. Geol. Survey Prof. Paper 125-D, pp. 39-105.
46. 1920 Lower Miocene foraminifera of Florida. U. S. Geol. Survey
Prof. Paper 128-B, pp. 67-74, 1 pl.
47. 1921 American species of Operculina and Heterostegina. U. S. Geol.
Survey Prof. Paper 128-E, pp. 125-137, 4 pls.
48. 1922 The foraminifera of the Mint Springs calcareous marl member
of the Marianna limestone. U. S. Geol. Survey Prof. Paper
129-F, pp. 87-122.
49. 1922 The foraminifera of the Byram calcareous marl at Byram,
Mississippi. U. S. Geol. Survey Prof. Paper 129-E,
pp. 87-122, 15 pls.
50. 1930 The foraminifera of the Choctawhatchee formation of Florida.
Florida Geol. Survey Bull. 4, 63 pp., 12 pls.
51. 1931 A new Plectofrondicularia from Florida. Cushman Lab. Foram.
Res. Contr. Vol. 7, pt. 3, No. 109.
52. Cushman, J. A., and Ponton, G. M.
1932 The foraminifera of the upper, middle and part of the lower
Miocene of Florida. Florida Geol. Survey Bull. 9, 147 pp.,
2 figs., 17 pls.
53. 1935 Upper Eocene foraminifera of the southeastern States. U. S.
Geol. Survey Prof. Paper 181, 23 pls.
54. Cushman, J. A. and McGlamory, Winnie.
1938 Oligocene foraminifera from Choctaw Bluff, Alabama. U. S.
Geol. Survey Prof. Paper 189-D, 119 pp.

55. 1939 New species of foraminifera from the lower Oligocene of Alabama. Cushman Lab. Foram. Res. Contr., Vol. 15, pt. 3, No. 209, pp. 45-49.
56. Cushman, J. A.
1939 Eocene foraminifera from submarine cores off the eastern coast of North America. Cushman Lab. Foram. Res. Contr., Vol. 15, pt. 3, No. 210, pp. 49-76.
57. Cushman, J. A. and Garrett, J. B.
1939 Eocene foraminifera of Wilcox age from Woods Bluff, Alabama. Cushman Lab. Foram. Res. Contr., Vol. 15, pt. 4, No. 211.
58. Cushman, J. A.
1940 Midway foraminifera from Alabama. Cushman Lab. Foram. Res. Contr., Vol. 16, pt. 3, No. 222.
59. Cushman, J. A. and Todd, Ruth.
1941 Species of *Uvigerina* in the American Miocene. Cushman Lab. Foram. Res. Contr., Vol. 17, pt. 2, No. 229.
60. 1942 The foraminifera of the type locality of the Naheola formation. Cushman Lab. Foram. Res. Contr., Vol. 18, pt. 2, No. 237.
61. Cushman, J. A.
1944 A Paleocene foraminiferal fauna from the Coal Bluff marl member of the Naheola formation of Alabama. Cushman Lab. Foram. Res. Contr., Vol. 20, pt. 2, No. 255.
62. 1945 A foraminiferal fauna from the Twiggs Clay of Georgia. Cushman Lab. Foram. Res. Contr., Vol. 21, pt. 1, No. 265.
63. Dall, W. H.
1887 Notes on the geology of Florida. Am. Jour. Sci., 3d ser., Vol. 34, pp. 161-170.
64. Dall, W. H. and Harris, G. D.
1892 Correlation Papers: Neocene of North America. U. S. Geol. Survey Bull. 84. (The geology of Florida is described by the senior author on pp. 85-158).
65. Dall, W. H. and Stanley-Brown, T.
1894 Cenozoic geology along the Apalachicola River. Geol. Soc. America Bull. V, pp. 147-170, 1 pl. (Abstract in Am. Geologist XIII, pp. 137-138, (1-2p)).
66. Dall, W. H.
1890-1903 Contributions to the Tertiary fauna of Florida. Wagner Free Inst. Sci. Trans., Vol. III, pts. I-VII, 1620 pp., 60 pls.
67. 1916 A contribution to the invertebrate fauna of the Oligocene beds of Flint River, Georgia. U. S. Nat. Mus. Proc., Vol. 51, pp. 487-528, 6 pls.

68. Ellis, A. O.
 1939 Significant foraminifera from the Chickasawhay beds of Wayne County, Mississippi.
 Jour. Paleontology, Vol. 13, pp. 423-424.
69. Fenneman, N. M.
 1938 Physiography of the eastern United States.
 XIII + 714 pp., illus., incl. geol. maps. McGraw-Hill Book Co., Inc., New York.
70. Foerste, A. F.
 1893 Studies on the Chipola Miocene of Bainbridge, Georgia, and Alum Bluff, Florida.
 Am. Jour. Sci., 3d ser. Vol. XLVI, pp. 244-254.
71. 1894 The Upper Vicksburg Eocene and the Chattahoochee Miocene of Southwest Georgia and adjacent Florida.
 Am. Jour. Sci., 3d ser. Vol. XLVIII. pp. 41-54.
72. Gardner, J. A.
 1936 Additions to the fauna of the Alum Bluff group of Florida.
 Florida Geol. Survey Bull. 14, 82pp., 10 pls.
73. 1944 The molluscan fauna of the Alum Bluff group of Florida.
 U.S. Geol. Survey Prof. Paper 142, 491 pp., 51 pls. (incomplete)
 pts. 1-4, 1926; pt. 5, 1928; pt. 6, 1937; pt. 7, 1944.
74. Gravell, D. W., and Hanna, M. A.
 1938 Subsurface Tertiary zones of correlations through Mississippi, Alabama and Florida.
 Am. Assoc. Petroleum Geologists Bull., Vol. 22, pp. 984-1014.
75. Gregory, W. K.
 1930 A fossil teleost fish of the snapper family (Lutianidae) from the lower Oligocene of Florida.
 Florida Geol. Survey Bull. 5, pp. 7-17, 2 figs., 4 pls.
76. Gunter, Herman, and Sellards, E. H.
 1912 The underground water supply of west central and west Florida.
 Florida Geol. Survey 4th Ann. Rept., pp. 81-155, 4 pls., 12 figs.
77. Gunter, Herman, and Ponton, G. M.
 1931 The possibility of petroleum in Florida.
 Florida Geol. Survey 21-22d Ann. Rept., pp. 59-65.
78. Harris, G. D.
 1902 Sections made in 1901 of the Chattahoochee series in Northwestern Florida, (contained in "Comparison of the Oligocene" by C. T. Maury.)
 Am. Paleontology Bull. 15, pp. 53-58.
79. Hay, O. P.
 1928 A review of recent reports on investigations made in Florida on Pleistocene geology and paleontology.
 Washington Acad. Sci. Jour., Vol. 17, pp. 233-241.

80. Heilprin, Angelo.
1884 Remarks on Florida Tertiary.
Science, Vol. III, pp. 606-607 (Acad. of Nat. Sciences,
Philadelphia, April 22).
81. 1887 On the occurrence of nummulitic deposits in Florida and the
association of nummulites with a fresh-water fauna.
Acad. Nat. Sci. Philadelphia Proc., pp. 189-193.
82. Hilgard, E. W.
1881 The Later Tertiary of the Gulf of Mexico.
Am. Jour. Sci., 3d ser., Vol. XXII, pp. 58-65, map.
83. Hill, E. A.
1934 Another guess about oil possibilities in Florida.
Oil Weekly, Vol. 72, No. 6, pp. 48-50.
84. Howe, Henry V., et al.
1935 Ostracoda of the Arca zone of the Choctawhatchee Miocene of
Florida.
Florida Geol. Survey Bull. No. 13, 37 pp., pls. I-IV.
85. Imlay, R. W.
1941 Jurassic fossils from Arkansas, Louisiana and eastern Texas.
Jour. Paleontology, Vol. 15, No. 3, pp. 256-278, 2 pls., 2 figs.
86. 1943 Jurassic formations of the Gulf region.
Am. Assoc. Petroleum Geologists Bull., Vol. 27, No. 11, pp.
1407-1533.
87. Jenny, W. P.
1933 Florida geology not favorable to oil accumulation.
Oil Weekly, Vol. 71, No. 3, pp. 23-26.
88. Johnson, L. G.
1888 The structure of Florida.
Am. Jour. Sci., 3d ser., Vol. XXXVI, pp. 230-236.
89. 1891 The Chattahoochee embayment.
Geol. Soc. America Bull. 111, pp. 128-132.
90. Langdon, D. W., Jr.
1889 Some Florida Miocene.
Am. Jour. Sci., 3d ser., Vol. XXXVIII, pp. 322-324.
91. 1891 Geological section along the Chattahoochee River from Columbus
to Alum Bluff.
Geol. Survey Georgia, 1st Rept. Prog. 1890-91, pp. 90-97.
92. 1894 Geology of the Coastal Plain of Alabama.
Geol. Survey Alabama. (The description of Florida formations
occurs on pp. 373-376.)

93. McGee, W. J.
 1891 The Lafayette Formation.
 U.S. Geol. Survey 12th Ann. Rept. 1890-1891, pp. 347-521.
94. MacNeil, F. S.
 1944 Oligocene stratigraphy of southeastern United States.
 Am. Assoc. Petroleum Geologists Bull., Vol. 28, No. 9, pp.
 1313-1354.
95. Mansfield, W. C.
 1916 Mollusks from the type locality of the Choctawhatchee marl.
 U. S. Nat. Mus. Proc., Vol. 51, pp. 599-607.
96. 1930 Miocene gastropods and scaphopods of the Choctawhatchee formation
 of Florida.
 Florida Geol. Survey Bull, 3, 142 pp., 21 pls.
97. 1932 Miocene pelecypods of the Choctawhatchee formation of Florida.
 Florida Geol. Survey Bull. 8, 240 pp., 3 figs., 34 pls.
98. Mansfield, W. C., and Ponton, G. M.
 1932 Faunal zones in the Miocene Choctawhatchee formation of Florida.
 Washington Acad. Sci. Jour., Vol. 22, No. 4, pp. 84-88, 1 fig.
99. Mansfield, W. C.
 1934 A new species of Pecten from the Oligocene near Duncan Church,
 Washington County, Florida.
 Washington Acad. Sci. Jour., Vol. 24, No. 8, pp. 331-333, 3 figs.
100. 1935 New Miocene gastropods and scaphopods from Alaque Creek Valley,
 Florida.
 Florida Geol. Survey Bull. 12, 64 pp., 5 pls.
101. 1936 Stratigraphic significance of Miocene, Pliocene, and Pleistocene
 Pectinidae in the southeastern United States.
 Jour. Paleontology, Vol. 10, No. 3, pp. 168-192, 2 pls., 1 fig.
102. 1936 A new species of "Crassatellites" from the upper Miocene of
 Florida.
 Washington Aca. Sci. Jour., Vol. 26, No. 10, p. 395.
103. 1937 New mollusks from the Choctawhatchee formation of Florida.
 Jour. Paleontology, Vol. 11, No. 7, pp. 608-612, 1 pl.
104. 1937 Mollusks of the Tampa and Suwannee limestones of Florida.
 Florida Geol. Survey Bull. 15, 334 pp., 23 pls., 10 figs.
105. 1938 Oligocene faunas from the lower and upper beds on the A. L.
 Parrish farm, Washington County, Florida.
 Washington Acad. Sci. Jour., Vol. 28, No. 3, pp. 93-107, 19 figs.

106. 1940 Mollusks of the Chickasawhay marl.
Jour. Paleontology, Vol. 14, pp. 171-226.
107. Matson, G. C., and Clapp, T. G.
1909 A preliminary report on the geology of Florida with special
reference to the stratigraphy.
Florida Geol. Survey 21-22d Ann. Rept., pp. 25-173, map.
108. Matson, G. C., and Sanford, Samuel.
1913 Geology and ground waters of Florida.
U.S. Geol. Survey Water-Supply Paper 319, 445 pp., map.
109. Matson, G. C.
1916 The Pliocene Citrolelle formation of the Gulf coastal plain.
U.S. Geol. Survey Prof. Paper 98, pp. 167-192.
110. Maury, C. J.
1902 A comparison of the Oligocene of western Europe and the southern
United States.
Am. Paleontology Bull., No. 15, 118 pp.
(The Oligocene of Florida is described on pp. 45-67.)
111. Mossom, D. S.
1925 A preliminary report on the limestones and marls of Florida.
Florida Geol. Survey 16th Ann. Rept., pp. 27-203, 7 figs., 52 pls.
112. 1926 A review of the structure and stratigraphy of Florida, with
special reference to the petroleum possibilities.
Florida Geol. Survey 17th Ann. Rept., pp. 169-275, 1 fig.
113. Munyan, A. C.
1943 Subsurface stratigraphy and lithology of Tuscaloosa formation
in southeastern Gulf Coastal Plain.
Am. Assoc. Petroleum Geologists Bull., Vol. 27, No. 5, (May)
pp. 596-607, 2 figs. (Florida: pp. 603-605.)
114. Pumpelly, Raphael.
1893 An apparent time-break between the Eocene and the Chattahoochee
Miocene in Southwestern Georgia.
Am. Jour. Sci., 3d ser., Vol. XLVI, pp. 445-447.
115. Richards, H. G.
1938 Marine Pleistocene of Florida.
Geol. Soc. America Bull., Vol. 50, pp. 1885-1898.
116. Romans, Bernard.
1775 A concise Natural History of East and West Florida.
New York, 342 pp. Printed for the author.
117. Rowland, H. J.
1936 The Atlantic and Gulf Coast Tertiary Pectinidae of the United
States.
Am. Midland Naturalist, Vol. 17, pp. 985-1017.

118. Roy, C. J.
1939 Type locality of the Citronelle formation, Citronelle, Alabama.
Am. Assoc. Petroleum Geologists, Bull. Vol. 23, pp. 1553-1559.
119. Schuchert, Charles.
1943 Stratigraphy of the eastern and central United States.
John Wiley and Sons, New York, 1013 pp.
120. Sellards, E. H. and Gunter, Herman
1909 The fuller's earth deposits of Gadsden County, Florida.
Florida Geol. Survey 2d Ann. Rept., pp. 253-291.
121. Sellards, E. H., Gunter, Herman, and Cox, N. H.
1911 Roads and road materials of Florida.
Florida Geol. Survey Bull. 2.
122. Sellards, E. H.
1912 The soils and other surface residual materials of Florida.
A study in agrogeology.
Florida Geol. Survey 4th Ann. Rept. 1910-1911, pp. 7-79, 12 pls.,
3 figs.
123. 1916 Dead Lake of the Chipola River, Florida. (Abstract.)
Geol. Soc. America Bull. 27, p. 109.
124. 1916 Fossil vertebrates from a new Miocene fauna; new Pliocene
species; the Pleistocene fauna.
Florida Geol. Survey 8th Ann. Rept., pp. 77-119.
125. Sellards, E. H., and Gunter, Herman
1918 Geology between Choctawhatchee and Aucilla Rivers in Florida.
Florida Geol. Survey 10-11th Ann. Rept., pp. 77-102.
126. 1918 Geology between the Choctawhatchee and Apalachicola Rivers.
Florida Geol. Survey 10-11th Ann. Rept., pp. 79-101, 2 figs., map.
127. Sellards, E. H.
1919 Review of the Geology of Florida with special reference to
structural conditions.
Florida Geol. Survey 12th Ann. Rept., pp. 105-141.
(West Florida: pp. 119-120).
128. 1919 Geology of Florida.
Jour. Geology, Vol. 27, No. 4, pp. 286-302, 1 pl., 1 fig.
129. 1919 Comanchean formations underlying Florida.
Am. Jour. Sci., 4th ser., Vol. 48, pp. 13-16.
130. Sellards, E. H., and Gunter, Herman
1922 On the petroleum possibilities of Florida.
Florida Geol. Survey 14th Ann. Rept., pp. 83-135, 10 figs., map.

131. Shaler, N. S.
1890 The topography of Florida - With a note by Alexander Agassiz.
Mus. Comparative Zoology, Vol. XVI, No. 7, pp. 139-156, pl.
(abst. Am. Naturalist, Vol. XXIV, 768).
132. Sharp, H. S.
1938 "Steepheads" and spring sapping in Florida---Holt and Niceville
Quadrangles, Florida.
Jour. Geomorphology, Vol. 1, No. 3, pp. 247-248.
133. Smith, E. A.
1881 On the geology of Florida.
Am. Jour. Sci., 3d ser., Vol. 21, pp. 292-309.
134. 1906 On some post-Eocene and other formations of the Gulf Region of
the United States. (Address)
Am. Assoc. Advancement Sci. Proc., pp. 357-374.
135. 1914 Pioneers in Gulf Coastal Plain geology. (Presidential address)
Geol. Soc. America Bull., Vol. 25, pp. 157-178.
(Florida: pp. 174-176).
136. Smith, R. H.
1941 Micropaleontology and stratigraphy of a deep well at Niceville,
Okaloosa County, Florida.
Am. Assoc. Petroleum Geologists Bull., Vol. 25, No. 2, pp.
263-286, 2 pls., 2 figs.
137. Spencer, J. W.
1893 Terrestrial submergence southeast of the American continent.
Abstract.
Geol. Soc. America Bull., Vol. 5, pp. 19-22. (with discussions
by W. P. Blake and others).
138. Stephenson, L. W.
1928 Structural features of the Atlantic and Gulf Coastal plain.
Geol. Soc. America Bull., Vol. 39, pp. 887-900, Dec. 30.
139. Stephenson, M. R.
1938 Miocene and Pliocene Ostracoda of the genus Cytheridea from
Florida.
Jour. Paleontology, Vol. 12, pp. 127-148.
140. Sutherland, W. J.
1908 Physiography of the Gulf Coastal Plains.
Jour. Geography, Vol. 6, No. 11, pp. 337-347, June.
141. Toulmin, L. D.
1940 The Salt Mountain limestone of Alabama.
Geol. Survey Alabama Bull. 46, 126 pp., 5 pls., 14 figs.

142. 1940 Eocene brachiopods from the Salt Mountain limestone of Alabama.
Jour. Paleontology, Vol. 14, No. 3, pp. 227-233, 1 pl.
143. 1941 Eocene smaller foraminifera from the Salt Mountain limestone
of Alabama.
Jour. Paleontology, Vol. 15, No. 6, pp. 567-611, 5 pls., 23 figs.
144. Vaughan, T. W.
1901 Fuller's earth of southwestern Georgia and western Florida.
U.S. Geol. Survey Mineral Resources, pp. 922-934.
145. 1902 Evidence of recent elevation of the Gulf Coast along the westward
extension of Florida.
Science, new ser., Vol. XVI, p. 514.
(Rise of level of one and one-half feet believed to have occurred
at St. Marks within the last 50 years).
146. Vaughan, T. W., and Cooke, C. W.
1914 Correlation of the Hawthorn Formation.
Washington Acad. Sci. Jour., Vol. 4, No. 10, pp. 250-253, May 19.
147. Vaughan, T. W.
1924 Criteria and status of correlation and classification of Tertiary
deposits.
Geol. Soc. America Bull., Vol. 35, pp. 677-742.
148. 1927 Notes of the types of Lepidocyclina mantelli (Morton) Gumbel
and on topotypes of Nummulites floridanus Conrad.
Acad. Nat. Sci. Philadelphia Proc., Vol. 79, pp. 299-303.
149. 1928 New species of Operculina and Discocyclina from the Ocala
limestone.
Florida Geol. Survey 19th Ann. Rept., 1926-1927, pp. 155-165.
150. Vaughan, T. W., and Cole, W. S.
1936 New Tertiary foraminifera of the genera Operculina and Opercu-
linoides from North America and the West Indies..
U.S. Nat. Mus. Proc., Vol. 83, pp. 487-500
151. Vernon, R. O.
1942 Geology of Holmes and Washington Counties, Florida.
Florida Geol. Survey Bull. 21, 161 pp., 20 figs.
152. 1943 Florida mineral industry with summaries of production for
1940 and 1941.
Florida Geol. Survey Bull. 24.
153. Weinzierl, J. F.
1931 A possible oil and gas field in northwestern Florida.
Oil Weekly, Vol. 63, No. 5, pp. 58-59.

154. Williams, J. L.

1827 View of west Florida.

H. F. Tanner and author, Philadelphia.

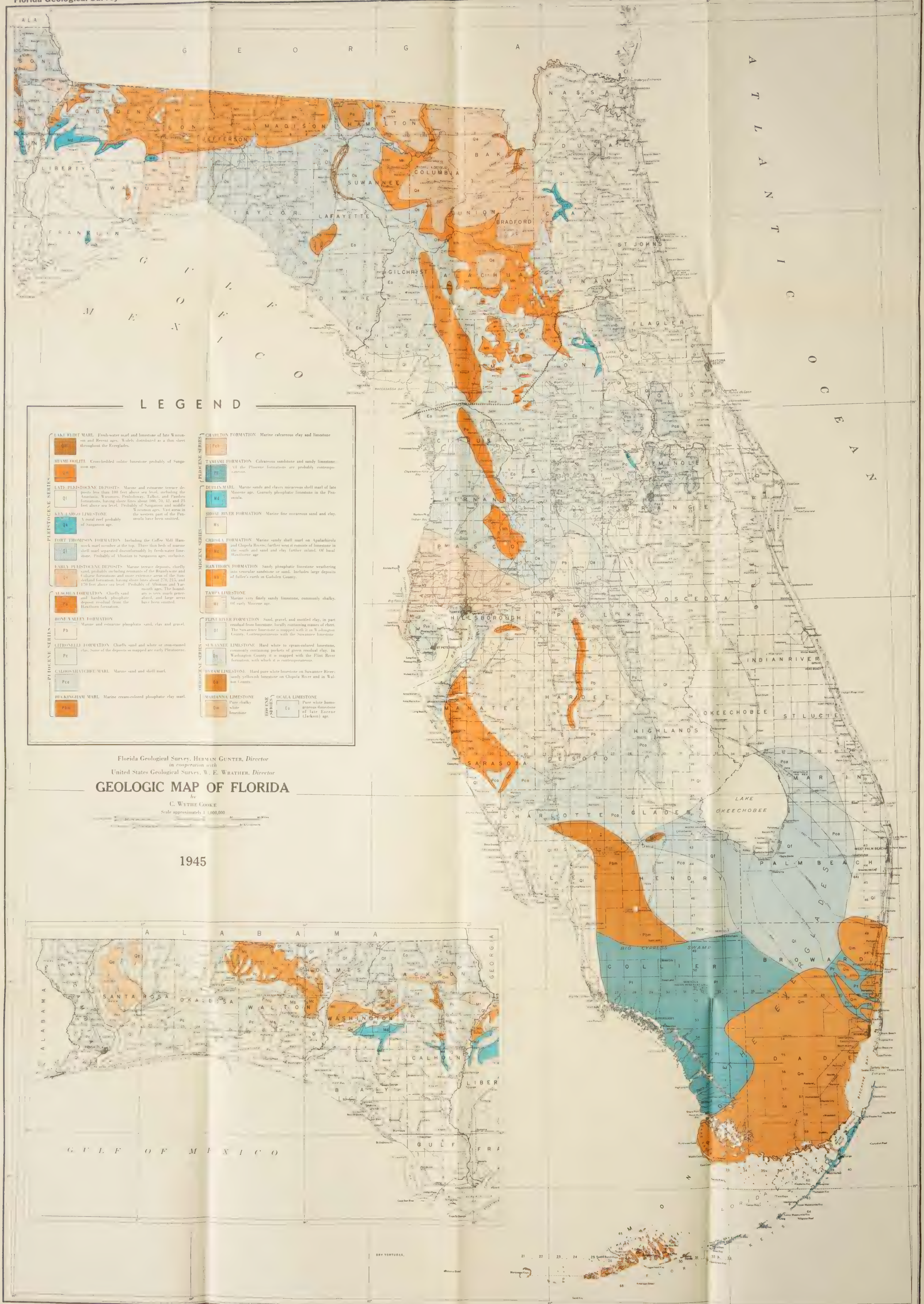
(Embracing its geography, topography, etc., with an appendix treating of its antiquities, land titles and canals, and containing a map exhibiting a chart of the coast, a plan of Pensacola, and the entrance of the harbor, 178 pp. and folded colored map.)

155. Wilmarth, H. G.

1938 Lixicon of geological names of the United States.

U.S. Geol. Survey Bull. 896, 2 pts., 2396 pp.

ENICO KLASP
No. 82 — $8\frac{1}{4} \times 11\frac{1}{4}$
Made in U. S. A.



Florida Geological Survey, HERMAN GUNTER, Director
in cooperation with
United States Geological Survey, W. E. WRATHER, Director
GEOLOGIC MAP OF FLORIDA
by
C. WYTHE COOKE
Scale approximately 1:1,000,000

1945

T

2

3

T

2

4

T

T
4
N

T
3
N

T
2

UNIVERSITY OF ILLINOIS-URBANA



3 0112 027298352